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ABSTRACT

Provided is a congressional study which analyzes the interactions between contemporary practice of science, technology, and the formulation and conduct of U.S. foreign policy. Six cases illustrating the interaction of science, technology, and diplomacy are reviewed and six general issues, including topics such as nuclear power, seabed resources, U.S.-Soviet relations, global health, U.S. scientists abroad, and the brain drain, are addressed. A series of six essays then examine the studies and issues on the general theme of the interaction of science, technology, and diplomacy. General findings indicate that U.S. diplomacy, policy formation, and policy execution has neglected technological expertise and managerial skills. (SL)

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SCIENCE, TECHNOLOGY, AND AMERICAN DIPLOMACY

SCIENCE, TECHNOLOGY, AND DIPLOMACY IN THE AGE OF INTERDEPENDENCE

PREPARED FOR THE

SUBCOMMITTEE ON INTERNATIONAL SECURITY
AND SCIENTIFIC AFFAIRS

OF THE

COMMITTEE ON INTERNATIONAL
RELATIONS
U.S. HOUSE OF REPRESENTATIVES

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(As part of an extended study of the interactions of science and technology with United States foreign policy)

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FOREWORD

Science and technology are compelling determinants of the human condition. In September 1975 the United Nations General Assembly voted to convene an international conference on science and technology. The intent of this move was to allow the technologically sophisticated and dynamic elements of the U.N. family to focus the efforts of the 1979 General Assembly on a concerted program of global advance. The agenda of this program would include economic, social, political, and commercial concerns, but its backbone would be technological and managerial.

The depth and pervasiveness of the influence of science and technology—the ways in which technology, especially, has become the engine of dynamic change in the lives of the world's peoples—are incompletely assessed and exploited. It was out of a conviction of the need to understand and better manage the impact of technology on human relationships, and on the enduring issues of war and peace, of poverty and plenty, that the Subcommittee on International Security and Scientific Affairs, 6 years ago, asked the Congressional Research Service to undertake a wide-ranging series of studies on Science, Technology, and American Diplomacy.

Under the leadership of Dr. Franklin P. Huddle as project director and Mr. Warren R. Johnston as associate director, the CRS series has traced in parallel many of the myriad problems in the interface of science, technology, and U.S. foreign policy. As summed up and interpreted in the present publication, *Science, Technology, and Diplomacy in the Age of Interdependence*, it has also identified many opportunities for meeting these problems. The general emphasis of this study is parallel to that of the U.N. effort; with respect to the U.S. role specifically, it points to the imperative of making better use of two great American strengths, technological inventiveness and managerial skill, and to the further imperative of systematic efforts to plan for the future.

In March 1970, in the foreword to the first committee print of the study series, I stated the belief that the series would prove to be of major use to the Congress, the executive branch, the Foreign Service, the scholarly community, and others, in a cooperative effort to enhance our Nation's ability to conduct its international relations in an age of science and technology. With this final report, the research and analysis phase comes to a close. In the ensuing legislative phase of the project, the locus of effort will be the membership and staff of the House Committee on International Relations. For this phase, it is my hope and expectation that the analytical contributions of the Congressional Research Service—and particularly this final integrating study—will prove in a practical way to have yielded three separate sets of products: (1) specific legislative options to strengthen the conduct of ongoing technical diplomacy; (2) encouragement of a consensus toward stronger and longer-range planning of technical initiatives in support of U.S. diplomacy, involving closer cooperation of the Executive Office, appropriate governmental departments (with special attention to areas often neglected because of their primarily domestic orientation), and the legislative branch; and (3) a more far-reaching participation in the foreign policy process throughout the Federal Government. I would hope to see this participation involve the academic and technical communities, private industry, and concerned citizen groups, along with the more traditional planning mechanisms.

Leaders of our diplomatic, technological, and national security affairs are not devoid of imagination or insensitive to the oppressive weight of danger and insecurity ahead. However, if these leaders propose to meet future threats with the same strength of purpose and creative initiative that have largely marked the first two centuries of American independence, they must seek new forms and find new applications in a world of growing interdependence. The problem of how to manage our relationships in such a world resolves in large part into the problem of managing technological dynamism and directing it to humane ends. *Science, Technology, and Diplomacy in the Age of Interdependence* is offered for whatever light it may shed on these twin problems.

Clement J. Zablocki,
Chairman, Subcommittee on International
Security and Scientific Affairs.

OTHER DOCUMENTS IN THE SERIES

A Selected, Annotated Bibliography of Articles, Books, Documents, Periodicals, and Reference Guides. Compiled by Genevieve Knezo. (69 pages.) Issued March 1970.[1]

Toward a New Diplomacy in a Scientific Age. An introduction to the entire study by Franklin P. Huddle. (28 pages.) Issued April 1970.[1]

The Evolution of International Technology. A review of the emergence of technology as a factor of change in international relations by Franklin P. Huddle. (70 pages.) Issued December 1970.[2]

The Politics of Global Health. A study of worldwide efforts to prevent epidemic disease by Freeman H. Quimby. (79 pages.) Issued May 1971.[2]

Exploiting the Resources of the Seabed. A survey of technical, economic, legal, and political considerations involved in using the natural wealth of land below the seas by George A. Doumani. (86 pages, plus appendixes.) Issued July 1971.[2]

Beyond Malthus: The Food/People Equation. A study of the interrelation of food and population and the resulting impact on international affairs by Allan S. Nanes. (96 pages.) Issued October 1971.[2]

The Mekong Project: Opportunities and Problems of Regionalism. A case study of the accomplishments and failures of the massive Indochina works project by Franklin P. Huddle. (86 pages.) Issued May 1972.[2]

The Baruch Plan: U.S. Diplomacy Enters the Nuclear Age. A study of an early, serious attempt to bring atomic energy and weapons under international control by Leneice N. Wu. (67 pages.) Issued August 1972.[2]

Commercial Nuclear Power in Europe: The Interaction of American Diplomacy With a New Technology. Analysis of the interaction during last 30 years between American diplomacy and the technological development of nuclear power in Europe by Warren H. Donnelly. (163 pages.) Issued December 1972.[2]

U.S.-Soviet Commercial Relations: The Interplay of Economics, Technology Transfer, and Diplomacy. An assessment of the linkages in U.S.-Soviet relations among diplomacy, economics, and technology transfer by John P. Hardt and George D. Holliday. (105 pages.) Issued June 1973.[2]

The Political Legacy of the International Geophysical Year. An analysis of attitudes, behavior patterns, and procedures followed in the IGY as a step toward détente by Harold Bullis. (64 pages.) Issued November 1973.[2]

U.S. Scientists Abroad: An Examination of Major Programs for Nongovernmental Scientific Exchange. A study of major Federal programs which send nongovernment U.S. scientists and technical personnel abroad by Genevieve J. Knezo. (163 pages.) Issued April 1974.[2]

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[1] Documents now out of print and not available from the International Relations Committee or the Government Printing Office.

[2] Documents available from the International Relations Committee only.

Brain Drain: A Study of the Persistent Issue of International Scientific Mobility. Assessment of the costs and benefits of the migration of technically trained persons, especially from developing to developed countries, by Joseph G. Whelan. (272 pages.) Issued September 1974.[3]

Science and Technology in the Department of State: Bringing Technical Content Into Diplomatic Policy and Operations. This concluding study of the series, by Franklin P. Huddle, analyzes the impact of science and technology on the Department of State, and describes departmental efforts and opportunities to relate science and technology to its mission. (180 pages.) Issued June 1975.[3]

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[3] Documents available from the International Relations Committee or the Government Printing Office.

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LETTER OF TRANSMITTAL

THE LIBRARY OF CONGRESS,
CONGRESSIONAL RESEARCH SERVICE,
Washington, D.C., February 2, 1976.

Hon. CLEMENT J. ZABLOCKI,
Chairman, Subcommittee on International Security and Scientific Affairs, Committee on International Relations, U.S. House of Representatives, Washington, D.C.

DEAR MR. CHAIRMAN: I am pleased to submit this concluding document in the Science, Technology, and American Diplomacy research project which the Congressional Research Service has carried out at your request.

The first two submissions, you will recall, were an annotated bibliography and a prospectus. They were followed by individual studies in some depth (prepared by 10 authors associated with four CRS research divisions) of 12 different policy issues related to the general theme. The present study, *Science, Technology, and Diplomacy in the Age of Interdependence*, subjects the previous 12 to analysis, first examining the 12 studies one by one and then looking at them collectively from several relevant perspectives. Its purpose is to provide the subcommittee with a wide range of insights into the interaction in contemporary practice of science, technology, and the formulation and conduct of U.S. foreign policy. As you asked us to do, we have tried to present these insights in terms which the subcommittee could translate into legislative initiatives or put to other appropriate congressional uses.

I take particular satisfaction in this study as it appears to employ a novel if unpretentious methodology of political science analysis. The study demonstrates, I think, the utility of systematic, point-by-point evaluation of real-life scenarios or cases, based on thorough documentation, to yield broad principles of policy in a field of transcendent national importance.

The authors of the present volume are the two CRS senior specialists who have guided this major research enterprise from its inception: Dr. Franklin P. Huddle, senior specialist in science and technology, who with Dr. John H. Sullivan (then staff consultant to the subcommittee) developed the concept of the study series in 1969, and who has served as the director of the overall project; and Mr. Warren R. Johnston, formerly assistant chief of the CRS Foreign Affairs Division and now chief of the CRS Office of Special Programs, the associate project director.

In March 1970, in your Foreword to the first committee print of the series, you wrote: "Previous work by the subcommittee has indicated that, in many instances, U.S. foreign policy has lagged far behind technological innovations of worldwide importance. Through this study, we hope to find out . . . how America's performance can be improved in this vital area." On behalf of all in CRS who participated in it, let me express the hope that the study series culminating in the present submission will have proved worthy of your high expectations.

Let me also convey our thanks for the opportunity to undertake this challenging assignment.

Sincerely,

NORMAN BECKMAN,
Acting Director.

ACKNOWLEDGMENTS

It seems fitting on the completion of a research undertaking of the magnitude of Science, Technology, and American Diplomacy for the project director and associate director to claim the privilege of giving public recognition to the many significant contributions to the overall project, as well as to acknowledge the participation of those who helped in the preparation of the final study, *Science, Technology, and Diplomacy in the Age of Interdependence.*

To begin at the beginning: two successive staff consultants of the Subcommittee on International Security and Scientific Affairs, Dr. John H. Sullivan and Mr. George R. Berdes, are to be thanked for their constructive guidance on many occasions during the past 6 years and for their unfailingly sympathetic support of an enterprise that proved much more demanding, and extended over a considerably longer period of time, than was originally foreseen.

Apart from the codirectors, there were 10 authors of studies. They meritoriously deserve recognition and gratitude, not merely for superior accomplishment but for their tolerance of strenuous conditions of competing work assignments, their thousands of hours (in the aggregate) of volunteered overtime, and their assistance in the review and updating of material in this final study. One of the study authors, Genevieve J. Knezo, additionally produced the original annotated bibliography for the series, now replaced by the current bibliography (also prepared by Ms. Knezo) to be found at the end of this volume. Dr. Huddle's assistant, Mrs. Elaine Carlson, performed many essential editorial and research support tasks.

Dozens of others in CRS, over the years, contributed their time and skills in bibliographic, research, and clerical assistance, and in the review of studies in draft. CRS Coordinator of Research James W. Robinson reviewed the studies in their entirety and made many helpful suggestions. Outstanding clerical assistance in the production of the present volume was provided by Mrs. Eula C. Kenely and her staff in the CRS Senior Specialists Division and by Mrs. Margaret E. Rice of the CRS Office of Special Programs.

In addition, many scholars and officials outside CRS were generous with their help in reviewing portions of the draft and providing constructive criticism. Prof. Edgar S. Robinson of American University submitted extensive notes in review of *Science and Technology in the Department of State* which were of value in preparing the present study; he also served as consultant in the preparation of this concluding study. To him and to the other scholars, too numerous to cite individually, appreciation and thanks are expressed for their assistance in collecting facts, offering suggestions, and encouraging the ultimate completion of this undertaking.

A final important acknowledgment: gratitude beyond measure is due our wives, Clare Scott Huddle and Eunice C. Johnston, for 6 years of indispensable support and forbearance.

FRANKLIN P. HUDDLE.
WARREN R. JOHNSTON.

PREFACE

The finding of this study is that U.S. diplomacy is neglecting two powerful instruments of policy formation and policy execution: technological expertise and management skill. Most of the countries of the world look to the United States as the undoubted leader in both technological achievement and in the skills of organization and administration to apply technology effectively. But during the rise of the United States to technological preeminence, the Department of State has given slight attention to the implications of technology for foreign policy. Only meager resources have been spared to search for ways to turn technology to achievement of diplomatic goals.

The emerging trend toward congressional participation in the diplomatic process plays a significant role in this context. The opportunity is at hand for the Congress to examine the uses of technology made by the executive branch toward the purposes of foreign policy.

More than that, the study suggests that the necessary teamwork of the legislative branch with the executive branch in the field of foreign policy requires that the Congress equip itself with its own resources of equal diplomatic expertise. The impressive array of technological implications for U.S. diplomacy further requires that these congressional resources of diplomatic expertise contain a strong technological element for both current oversight and long-range planning of future initiatives.

Technology has made intolerable the consequences of failure to attain the primary objectives of U.S. foreign policy. But technology also offers many opportunities for the attainment of these objectives. No element of national policy and no component of national program warrants more respect in the short-range or the long-range future of the United States.

I. INTRODUCTION

This is the concluding chapter in a 6-year study by the Congressional Research Service of the problems and functional interactions of science, technology, and American diplomacy. The study had its origins in congressional concern with science and technology that had been steadily mounting since World War II. The prospectus for the study, attributing to science and technology "an ever-increasing influence on domestic public policy," added that they "also appear to have a growing effect on the content and conduct of American foreign policy."[1]

The general purpose of the study, as stated in the prospectus, was "to provide Congress with background material useful in strengthening the resources that support the conduct of American diplomacy." For this purpose it would "describe and analyze the formulation and administration of American diplomatic policies having significant science and technology components."

More specifically, the study was designed to examine six "cases" and six "issues" in recent diplomatic history in order to—

1. characterize processes and problems involving the interaction of science and technology with diplomacy;
2. define organizational requirements for the effective formulation of important policies to direct and control activities involving this interaction;
3. identify ways in which the capabilities of agencies serving at this interface can be strengthened legislatively or administratively;
4. discover ways in which science and technology can better support foreign policy objectives of the United States; and
5. discover ways in which the conduct of diplomatic activities can better support the healthy growth of national and international science and technology.[2]

A quarter-century ago, in a report on "Science and Foreign Relations" for the Department of State, Lloyd V. Berkner posed two questions:

1. How can the potentialities of scientific progress be integrated into the formulation of foreign policy, and the administration of foreign relations, so that the maximum advantage of scientific progress and development can be acquired by all peoples?
2. How can foreign relations be conducted in such a manner as to create the atmosphere that is essential to effective progress of science and technology?[3]

The 12 completed studies in the series, and this final chapter of the project, are intended to suggest answers to Berkner's two questions.

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[1] U.S. Congress, House, Committee on Foreign Affairs, *Toward a New Diplomacy in a Scientific Age*, in the series Science, Technology, and American Diplomacy, prepared for the Subcommittee on National Security Policy and Scientific Developments by Franklin P. Huddle, Science Policy Research Division, Congressional Research Service, Library of Congress, Washington, D.C., U.S. Govt. Print. Off., 1970, 28 p. (Committee print.) p. 1.

[2] *Ibid.*, p. 4.

[3] *Ibid.*, p. 6.

However, much has happened in the 25 years since the questions were posed. It is unlikely that the participants in the Berkner report had in mind the vast scope of the impacts that science and technology would impose on the world of diplomacy. Space exploration, the use of satellites for communications and remote sensing, the ballistic missile deterrent impasse, the Green Revolution, the technological dedication to petroleum that made the oil embargo effective, supertankers, nuclear proliferation, and the technology transfer activities of multinational corporations have emerged as important diplomatic concerns since the publication of the Berkner report. Even the International Geophysical Year, in which Berkner was a leading participant, postdates by some years his scheme to bring science and technology into the Department of State.

The purpose of this final chapter of the extended study is to sift through the 12 chapters in which the 6 cases and 6 issues are analyzed, in order to present a summarization of the entire project. However, unlike most summaries, this publication contains new material: further thoughts by the authors of the 12 individual studies, and by the present authors (the project codirectors); assessment of the performance of the governmental decisionmaking apparatus in relation to the outcomes of these studies; and a discussion of the implications of the studies for congressional action. This concluding chapter is accompanied by a new annotated bibliography that updates the bibliography issued in 1970 at the opening of the project.[4]

Scope of the Study

The supporting studies of six cases and six issues summarized in this concluding study are as follows:

CASES

1. The Baruch Plan for internationalization of atomic energy.
2. The Eisenhower proposal for peaceful use of the atom.
3. The International Geophysical Year.
4. The Mekong regional development proposal.
5. Efforts to reach international agreement on exploiting the resources of the seabed.
6. The U.S.-U.S.S.R. trade treaty and technology transfer.

ISSUES

1. International impact of technology on diplomacy.
2. The politics of global health.
3. Food and population.
4. Temporary placement of U.S. scientists abroad.
5. The "brain drain" of technically trained people.
6. Bringing science and technology into the Department of State.

A decision was made at the outset of the project to exclude consideration of all subject matter that involved security-classified information. Accordingly, no military or intelligence topics were considered, and arms control was dealt with only to a limited extent in two of the papers which examined unclassified aspects of atomic energy cases. Several studies were abandoned with regret: those tentatively projected on the use of the social sciences in the U.S. Information Agency, the computer and information management, scientific research in the North Atlantic Treaty Organization, and the Treaty on Outer Space.

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[4] Both were prepared by Genevieve Johanna Knezo, analyst in science and technology of the Science Policy Research Division, Congressional Research Service. The present selective bibliography does not encompass all of the references cited in the introduction and the 12 individual studies, for it is a necessary feature of the case study approach that neither bibliography nor index can be both useful and comprehensive. In lieu of index, the project has adopted the device of frequent and descriptive headings, assembled in a table of contents. References consulted by the individual authors are cited fully in footnotes, while a supplemental listing of selected publications is presented in the appended bibliography.

The project director and associate director also regret that it was not possible to extend the study series to cover some other important areas: for example, research and development in the U.S. foreign aid program, global allocation of material and fuel resources, and science and technology activities in the complex of United Nations organizations.

Indeed, one of the difficulties in undertaking a broad policy study in the field of diplomacy is the richness of the subject and the attractiveness of the issues it presents. What was attempted, therefore, was the selection of a representative and manageable list of topics that were judged to yield instructive guidance to the Congress and to policy analysts in the executive branch. Perhaps it will be possible for the academic community to extend the analyses begun with the present series in 1970 into the topics neglected.

It was a part of the plan for the project that each of the 12 separate studies should perform 2 functions: It should stand alone as a useful account and analysis of an issue containing important policy questions and legislative values; and it should be an integral part of the total project on the managing of the interface of science and technology with diplomacy. There is evidence that the first purpose has already been served. This concluding analysis represents the effort to achieve the second purpose.

Methodology of the Study

The six cases and six issues examined in the total study necessarily bear some substantive relationship to each other. However, there is no intention of presenting them as a time sequence. This is not in any sense a chronology of science, technology, and American diplomacy since 1945, when the atomic bomb gave the subject a permanent urgency, or since 1950, when an early effort at serious appraisal was made in the Berkner Report. Each separate case or issue is presented in its own time frame. The focus of the study as a whole is on the nature of the problem of relating technical problems and opportunities to diplomatic methods, processes, and philosophy. Each case or issue is presented as a study complete in itself, but the series of these studies taken together provides a longitudinal report on the subject prepared during the years 1970 to 1975, inclusive, and covering selected events over a much longer timespan. Inescapably, the individual studies are somewhat time-dependent; accordingly, the date of original publication is indicated for each summary in this final report. The order of the summaries is determined by the topics and substantive matters rather than by the chronological order of their original issuance.

To eliminate some of the awkwardness that this methodology introduces, each author has reviewed his or her contribution to the study to bring it—more or less—up to date. Questions that have emerged since first issuance are indicated and comments on the original studies are responded to.

But to repeat: The purpose of the entire project is not historical but analytical; it is intended that the project as a whole will provide a coherent and reasonably comprehensive set of observations for use by the Congress in surveying the broad canvas of science, technology, and American diplomacy. Is the subject as crucial to the welfare of humanity as it is sometimes alleged to be? If so, why, and in what ways? What are its major areas of concern? What are its institutional and procedural problems? What possibilities are offered for legislative strengthening of the institutions and the processes involved?

In the prospectus which constituted the opening chapter of the series, it was promised that the format of the cases would generally be as follows:

Context and emergence of the case.
Definition of the problem.
Organizational aspects.
Chronological development.
Decisionmaking confrontation.
The decision process.
Description of the decision.
Consequences.
Assessment of the decision.
Assessment of the decision process.

A somewhat similar format, with allowances for the difference in subject matter, would be followed in treating the issues:

Definition of the issue.
Importance.
Changes in the issue over time.
Organizational aspects.
Policies advanced.
Alternatives available.
Diplomatic aspects.
Future prospects.

In thus imposing some degree of uniformity on the separate cases and issues it was hoped that from each separate study or chapter it would be possible to draw insights and evidence that could be presented in a coherent fashion in this final report bearing on the outstanding policy aspects of the science-technology-diplomacy interrelationship. These policy aspects would also be identified, and confirmed or qualified, by the cases and issues themselves.

Options for congressional consideration to strengthen the U.S. diplomatic apparatus, and possible ways to strengthen congressional participation in the foreign policy process, are identified from an examination of all the cases and issues, taken together. In this final report, these findings are offered and discussed, as are a number of questions of fundamental policy.

Organization of the Report

Following this introduction is a short characterization of the global context of trends and circumstances relevant to the subject of the project. Next, the six cases and the six issues are recapitulated, subjected to further analysis by both individual authors and project codirectors, and, where appropriate, brought up to date. Third, the report offers 6 essays of a more extended nature on policy alternatives that have emerged out of the 12 studies as important questions governing future direction of the diplomatic aspects of science and technology, and of the technical aspects of diplomacy. Whereas the recapitulations—which might be termed abstracts to which have been added observations from a broadened and more current perpective—involve focusing on the circumstances of the 12 studies, taken individually, and their implications for the general theme, each of the essays examines all 12 of the studies from the perspective of one major aspect or dimension of the general theme. Finally, the report brings to a focus, for consideration by the Congress, the central problems and opportunities of science, technology, and American diplomacy.

An Anticipation of the Findings

In this final report that concludes the CRS project, a number of separate products ought to emerge, properly documented and defined. One is a set of general conclusions as to the need for reform of the institutional arrangements for dealing with the broad scope of the subject. Another is a better appreciation of the importance of the relationship between diplomacy and both science and technology—but especially the latter. A third is the particular set of problems and opportunities that challenge the Congress to provide for their legislative solution or exploitation.

OPPORTUNITIES FOR INSTITUTIONAL REFORM

Many illustrations appear, in the publications of the project, of the need to eliminate institutional gaps and deficiencies in the U.S. diplomatic machinery that result from the emergence of technology as a major force, if not the primary force, compelling diplomatic change and adaptation to change. Among these illustrations are the following:

—The United States is preeminent in technology and administrative management but neither of these great attributes has been effectively mobilized by the Department of State for purposes of U.S. diplomacy.

—Virtually all the great problems facing the United States in 1975 have a large technological content. Yet those most knowledgeable about the generation, management, and utilization of new technology are not being inducted into the U.S. diplomatic machinery; conversely, too few of those who are part of the machinery of diplomacy are equipped by education, training, and experience to communicate effectively with the technologists or even to recognize when a technological/diplomatic problem exists.

—Multinational corporations are recognized as the primary mechanism for international transfer of technology, yet the United States has no policy for enlistment and coordination of this great organizational resource to advance the purpose of U.S. diplomacy.

—In its development of large technological systems, American engineering has led the world in its ability to deal with an infinity of variables, design options, and interfaces. Apart from mainly military initiatives of the Department of Defense, systems approaches congenial to technologists have not been exploited to develop technological initiatives beneficial to U.S. diplomacy.

—In the murky field of national security the emphasis has been on the design of nuclear weaponry and high-precision subnuclear weapons, to the neglect of the broader aspects of national security such as: vulnerability of external sources of materials essential to the U.S. economy, vulnerability of U.S. transport indispensable to heavy industry, and the economic health and innovativeness of basic materials industries.

—In the conduct of U.S. diplomacy, preference is given to bilateral agreements and programs. Science and technology are major ingredients in these activities but the resources of people with both diplomatic and technical expertise to serve these agreements—numbering 28 at present in the focal agency, the State Department—are seriously deficient. Moreover, resort to multilateral programs—which, though difficult, might be a more efficient and diplomatically more acceptable way to use these resources—is largely neglected or downgraded. Engineering support for the United Nations and its family of associated agencies is feeble.

—The style of American diplomacy contrasts sharply with that of American industry, in that engineering moves from the establishment of goals to the design of programs to achieve them while diplomacy waits for crises to appear and then attempts to cope with them.

Thus, the present report proposes that the need is at hand for a greater emphasis on long-range planning of diplomacy, with particular emphasis on its technological aspects. There needs to be a sustained and systematic search for future trends in the world outlook, a sustained effort to formulate U.S. goals, and a broad-gauge effort to discover organizing principles to bring a greater coherence to U.S. foreign policy.

Better and more accessible information is needed about all aspects of the global diplomatic scene and about the forces that technology brings to bear on it.

All signs seem to point to the need for a mobilization and coordination of the enormous intellectual resources of the United States in academic institutions and other nongovernmental centers of intellectual analysis whose contributions are insufficiently available to diplomatic decisionmakers today. At the same time, in the formulation and furtherance of diplomatic goals, every effort would be worth consideration to bring technological skills into closer conjunction with those of political and economic policy.

Finally, the role of technology could usefully be studied for opportunities to design international institutions to reverse the all-too-evident trend toward disaffection of the "Third World" toward the United States.

IMPORTANCE OF SCIENCE AND TECHNOLOGY FOR DIPLOMACY

Studies of war and diplomacy up to 1945 assumed that either of these two modes of international relationship was the extension of the other. The further assumption was implicit that no technology of warfare could ever dissolve or destroy the necessary interrelationship of war and diplomacy. At one stroke the atomic bomb transformed the relationship and made the avoidance of total war the prime goal of diplomacy; subsequent refinements and delivery systems confirmed the new order. At the same time, the nations of the world came to recognize technology itself as a principal foundation of national power and diplomatic influence.

The achievements of technology since World War II have done nothing to contradict this assessment. Technology has moved to center stage in the world diplomatic scene. The United States, as the principal national exponent in technological achievement, ought therefore to be recognized as diplomatically preeminent, but ought also to accept the responsibility for leading the way in the application of technology to the achievement of goals shared with the other nations of the world.

Thus, the theses emerge from the study of Science, Technology, and American Diplomacy that—

(1) In a rapidly changing world, the business of the Federal Government is increasingly the governance of relations with other States, working with them in rational and controlled ways toward global development and the betterment of the human condition.

(2) The historical role of violence or the threat of violence as the measure of diplomatic effectiveness has been considerably superseded by competitive excellence in technology.

(3) Domestically, the United States is foremost among world powers in technological excellence.

(4) Exercise of this preeminence for purposes of achieving world progress and harmony is both a moral imperative and a requirement of national security. As technology brings peoples closer together, these two motivations—national interest and international morality—tend more and more to reinforce each other. To the extent that they do not, the result may be chaos and, ultimately, failure of the human race, or at least of the present great civilizations of the world, to survive.

(5) There are difficulties, not yet susceptible of evaluation as to their relative importance, but certainly including—

> (a) The sheer numbers of contacts and agencies concerned with technology on the international level, for multiple purposes having an infinite variety of sponsorship, affiliation, and structure;
>
> (b) The grossly inadequate resources allocated by the United States to the analysis of its technological resources, with particular reference to their applicability toward global objectives of the United States;
>
> (c) Diffusion of effort, both because of the number of international claimants for attention and because of the absence of clearly defined foreign policy in technology—in particular, policy as to the proper relationship of U.S. efforts to those of other countries and of international organizations;
>
> (d) The tendency of less-developed nations to identify the U.S. mix of moral purpose and technological superiority with colonialism;
>
> (e) The fact that too much has been expected of American money and skills to yield quick results through sheer volume and technical virtuosity, and that too little has been said of the need for patience, perseverance, and acquired insights to accommodate to the psychologies of other cultures and to solve large problems of development by tackling the innumerable small, everyday problems.

PROBLEMS AND OPPORTUNITIES FACING THE CONGRESS

In the 12th study in the series, the importance was stressed of the diplomatic role of the Congress: "In the last analysis the Constitution vests in the Congress of the United States a large share of decisionmaking power on foreign as well as domestic affairs. Senatorial assent is the sine qua non of treatymaking. The power of the purse defines congressional control over all positive actions and programs of the Federal Government, foreign as well as domestic. The control of foreign trade and international transfers of persons, no less than the regulation of Armed Forces and the right to declare war, rests in the Congress." [5]

Also, the congressional need was suggested for strengthened institutional means to provide assistance in the following ways:

—Sustained monitoring of executive branch compliance with congressional intent in the area of scientific and technological impacts on foreign policy and international relations—and vice versa;

—Assessing the present and forecasting the future diplomatic environment as changes occur in response to the global spread of technological innovation;

—Assessing the secondary impacts and interrelationships of "international" technological issues;

—Examining the adequacy of U.S. "international" institutions in the face of changes in the diplomatic environment resulting from the global spread of technological innovation;

—Structuring and making coherent the array of foreign policy interactions with science and technology; and

—Maintaining a continuity of foreign policy expertise, an extended institutional memory, and an assistance cadre for major studies for "international" committees concerned with S. & T. questions, S. & T. committees concerned with foreign policy questions, and committees monitoring major technological missions with significant international implications.[6]

The interest of the Congress is inevitably—and more and more demonstrably—drawn to the importance of technology in its influence on the U.S. world posture, both directly through the diplomatic process and indirectly through the contributions of technology to U.S. economic health and vitality. Other congressional interests include the development of specific diplomatic initiatives employing technology for national and international benefit; and the evolution of sound policies for the sharing of U.S. technology abroad and for the mutually beneficial exchange of technology with other countries.

From these preoccupations, it would seem to follow that the Congress has a strong justification for considered action to supply (a) the best possible mechanism for long-range diplomatic planning in the Executive Office of the President; (b) means to strengthen organizational resources of the Department of State at home and abroad relative to science and technology; (c) positive guidance to the Department of State in the use of nongovernmental intellectual resources and institutions bearing on the relationship of diplomacy with science and technology; and (d) means to strengthen the resources supporting the Congress itself in making its own independent decisions on all these matters.

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[5] U.S. Congress, House, Committee on International Relations, *Science and Technology in the Department of State*, in the series Science, Technology, and American Diplomacy, prepared for the Subcommittee on International Security and Scientific Affairs by Franklin P. Huddle, Science Policy Research Division, Congressional Research Service, Library of Congress, 1975, 180 p. (Committee print.) p. 176.

[6] *Ibid.*, p. 143.

II. THE GLOBAL CONTEXT OF SCIENCE, TECHNOLOGY, AND AMERICAN DIPLOMACY

U.S. foreign policy today as never before is confronted by a world of restless strivings and uncertain directions. The modern world presents a complex mixture of dynamic new forces and drift, of active or potential conflict and détente, of wayward nationalism and a growing curriculum of multinational cooperative activities. The 200th anniversary of the beginnings of history's most successful experiment in political democracy finds the Nation pondering the question of how to define and advance those aspects of its heritage of independence that are valuable in a world of growing interdependence. The mid-1970s are thus a pivotal time: a time of reassessment of U.S. foreign policy, a time to search for a new and more stable, more durable world structure that could be realized by creative diplomatic initiatives, built deliberately according to a purposeful and coherent design. The resources that the United States can mobilize to meet this challenge are mainly the technology and managerial skills in which the Nation enjoys an unchallenged superiority. These two strengths, by a convenient fact of history, are precisely those needed by most of the other nations of the world in order to achieve progress toward their own internal national aspirations.

However, elements of this changing world do not automatically simplify or facilitate the exercise of U.S. leadership in applying these needed skills toward the achievement of a more stable, more durable world structure of cooperative and peaceful nations. The enormous complexity of the world of the 1970s derives from the great variety of nations and groupings of nations, each with its own rate and direction of political, economic, and technological change, leading in turn to changing goals and national attitudes. Change can generate conflict or it can promote harmony and cooperation. All of diplomacy resolves ultimately into the balancing of these opposites. Whether by bold creative moves or by slow and cautions increments, the largely unrecognized challenge facing the United States is to use its skills of technology and management to assemble the elements of the present changing world into the more constructive and reliable order on which the future of civilization so manifestly depends.

As the first consideration, what are the salient elements of the modern world? Some of them are the following:

Détente Vis-a-Vis the U.S.S.R.

The rigidities of the cold war are being replaced by a new flexibility in which the still-potent, still-dangerous adversary relationship between the United States and the Soviet Union is moderated by an uneasy and partial truce. This truce is marked by trade agreements, grain transactions, agreements on scientific and technological cooperation, technology transfers, and other unwarlike dealings epitomized by the term "détente."

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Deterrence

The underpinning of détente remains the possession by both the United States and the Soviet Union of an overwhelming nuclear destructive capability sufficient to deny survival to either party in the event of its use. Having learned to live with this fact for nearly two decades, leaders of each nation, while still maneuvering for some slight and transitory technological advantage,[7] are mainly seeking a pattern of beneficial relationships for their own country—recognizing that it may incidentally be beneficial to the adversary, but in the nonmilitary sphere. Emerging out of this uneasy truce may possibly be a more or less conscious balance of cooperation and conflict reflecting both ideological opposition and mutual anxiety over survival.

Weaponry

The purpose of weaponry is national security. However, the enormous destructive power of thermonuclear weapons accompanied by irresistible delivery system possessed by the United States and the Soviet Union has created an impasse. Both parties continue to invest scientific talents and resources in further refinements of nuclear weaponry but after a quarter century of this arms race the impasse continues, the destructive capability on both sides has increased, and the national security on both sides has diminished. Beneath this nuclear umbrella that makes overt conflict between the two superpowers an act of insanity, the adversaries have experimented with various kinds of war by proxy. Experiments in limited war by the United States in Korea and Vietnam showed that U.S. high technology weaponry had limited utility against a determined adversary in open warfare. Competitive supply of weaponry to the opposing sides in the Middle East has raised the level of intensity of that conflict and increased the risk of confrontation between the superpowers. Exports of U.S. weaponry to Latin America, Iran, Jordan, and other countries has multiplied the potential destructiveness of warfare involving these recipients; the gain to the United States has been measured in favorable balance-of-payments increments and varying degrees of transitory influence, but the cost has frequently been diminished national security for the United States. Proliferation of subnuclear weaponry continues but the ultimate consequences appear to offer no significant benefit to the United States while making small wars more lethal and draining the resources of small states to maintain their arsenals of high technology.

The P.R.C.

Emergence of the world's most populous nation from the self-imposed isolation of the period of painful transition to a Communist dictatorship is now in process. The growing military and economic power of this former "sleeping giant" gives indication that in time the People's Republic of China will become, in some respects at least, the coequal partner/adversary of both the United States and the Soviet Union. Meanwhile the P.R.C., currently more hostile toward the Soviet Union than toward the United States, seeks to persuade the latter of the dangers of Soviet aggressive designs.

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[7] A major technological advantage by either adversary would be intolerable to the other, and would pose a serious invitation to preemptive attack before the new weapon could be deployed.

Isolationism

One lively dispute that divided Americans in the period between the two great wars concerned the extent to which this country could remain aloof from European conflicts. The rise of Nazi Germany made the dispute salient but it was not resolved until Japanese ambitions for Asiatic hegemony precipitated a conflict halfway around the world from the initial theater of war. Thereafter, the ties among the Axis Powers undercut the position of those who favored U.S. isolation. The views of the interventionists were confirmed by events: It became fixed in U.S. foreign policy that the United States had an inescapable role, a compelling interest, and a great power responsibility in assuring world peace and stability. During the cold war, this theme dominated U.S. dealings abroad. An attempt to withdraw from this responsibility on the mainland of Asia led to the Korean war. The attempt to assert it led to the U.S. involvement in Vietnam. The declining fortunes of the United States in Vietnam led to renewed questioning of the extent of U.S. responsibility for maintaining peace and stability abroad, and even to a denial of such responsibility.

The rationale of great power control over small-country wars and internal disturbances remains ill-defined, but recent events in the Middle East have demonstrated the hazard of a unilateral withdrawal of one great power from the scene, and the perhaps equal hazard of several great powers' committing themselves to opposing causes of small nations. Several lessons can be drawn from this sequence. The most obvious is that the diplomatic reaction to this kind of crisis is necessarily ad hoc and governed by circumstances; rigid adherence to either isolationism or interventionism would invite disastrous consequences. A less obvious but more fundamental lesson is that the most successful kind of diplomacy is that which anticipates, and devises initiatives to keep small crises from developing. It is noteworthy that such successes generate no headlines and create no popular heroes, and are recognized only in a small community.

U.S. Economic Burdens

Since World War II the U.S. dollar has remained the primary—and until recently the strong and stable—currency of international commerce. U.S. assistance has been extended to many nations abroad in the form of nuclear deterrence, trained soldiery, and arms shipments to treaty allies and developing nations. These economic burdens have been increased by U.S. efforts to raise the technological levels of developing countries and by commitments to supply agricultural products to needy countries at less than market value. Efforts to persuade other developed countries to shoulder more of the burden of maintaining an international currency and credit system and to evolve, with the Soviet Union, a less demanding level of armament programs are features of the contemporary economic scene. However, the abrupt rise in world petroleum prices, unease in the Middle East, and persistent ideological and organizational obstacles to U.S.-U.S.S.R. cooperation tend to perpetuate the U.S. economic burdens.

The Changing U.S. Industrial Economy

The word "developed" applied to the U.S. national economy means that a large territory was settled, and that the predominant form of productive activity changed from agriculture to manufacturing during the first third of the 20th century, and from manufacturing to services in the second third. The products of agriculture and other extractive industries are food, fiber, lumber, and minerals; those of manufacturing are the highly diversified items ranging from clothing to automobiles; those of services industries are information and noncommodity-related activities. This sequence is probably not reversible, and the future health of the U.S. economy depends on the development of the services industries and the enhancement of their productivity. However, much of the services industry is in Government services which consume but do not generate income: Teachers, police, firemen, other State and municipal employees, Federal workers, and those in military service.

The trend in the United States toward services industries is the central feature in a complex of developments that include increased emphasis on the quality and quantity of security services that are provided by governments, such as protections against crime, unemployment, old age, and medical costs. Environmental protection has recently been added to this list. These services are costly and most of them are tax-supported instead of yielding tax revenues. Even as population movements toward urban centers have increased, erosion has occurred in the urban tax base as the wealthier segment of the urban population—and industry as well—has left the central city for the suburbs.

Another complicating factor, perhaps more transient, is the shift in the demographic distribution of population toward the young and old parts of the lifescale; these are less productive than persons in the middle range but absorb services at a higher rate.

The U.S. tax structure, which is effective in an expanding economy, tends to amplify cycles of high and low economic activity.

In turn, depression of the economy tends to worsen all the other economic problems that appear as the Nation proceeds further into the "services" phase. As the tax base shrinks and the services industries grow, the ability of the Federal Government to support ambitious programs diminishes, while the demand for services and payment for them continues to grow.

The extractive industries in the United States (accounting for half the labor force in 1890) now employ less than 5 percent of the labor force; manufacturing perhaps another 25 or 30 percent; and services the rest. The trend is toward further shrinkage of the first two and expansion of the third.

Shrinkage of the tax base and expansion of tax-supported activities have important implications for diplomacy: as to ability to fund military programs, support foreign assistance, contribute to United Nations agencies a major fraction of their support, and invest in large research and development efforts whose product is increasingly resisted by the industrial sector as profit margins narrow. The pattern of U.S. trade is likewise disrupted by internal economic dislocations. Stagflation, decline in the value of the dollar, and increasing competitive difficulty of U.S. industry all lead, in turn, to balance-of-payments deficits, making funding of U.S. programs abroad difficult.

As public standards in services and welfare rise, demands grow for a safer and more wholesome environment, control over hazardous conditions in industry, and reduced impacts of mining and forestry on wilderness areas.

While these brakes on industrial growth and productivity have not yet reached full strength, they have served to warn that these rising long-term and incremental costs in the industrial economy are approaching a serious stage. When coupled with the impact of the petroleum embargo and price increases from 1973 on, the observable result was a mixed situation of recession combined with inflation. The effects of these forces were felt most keenly in areas of largest populations, notably New York City. Escape from this dilemma is vital to the future health of the U.S. diplomatic posture in the world—as indeed also for U.S. domestic economic health—but the escape route remains undefined. The economic surplus needed to fund past levels of global programs may be a product of the U.S. past. U.S. foreign policy may rest more in the future on the skill of its diplomacy than on the weight of its economic programs.

The Shaky Global Economy

Economic interdependence has long prevailed in international relations. In the 19th century, Central Europe fed on American grain; agricultural nations relied on Chilean nitrates; England supplied capital to develop rail transportation systems in Argentina, India, the United States, and China; English textile mills wove cloth with United States and Indian cotton; and so on. During the 1920s efforts to restore this global economy conflicted with internal efforts to stabilize national economies and employment; the global monetary system collapsed in the face of stiff tariff barriers, competitive devaluations, multiple currency schemes, and quotas. Restoration of the global economy was a high-priority U.S. goal after World War II but, despite real progress, its achievement was obstructed by cold war divisiveness, nationalistic tendencies of former colonial regions, and—ultimately—the inability of the dollar to serve as a global currency in place of the long-defunct gold standard. Achievement of a stable global economy continues to be a U.S. goal. Détente with the Soviet Union was considered a positive move toward its achievement. But many old and some new forces obstruct progress toward the goal: internal obligations of developed countries to sustain economic growth and high levels of employment; resistance of developing countries to terms of trade which they see as blocking their escape from economic colonialism; and most recently the exploitation by the OPEC countries of a (probably temporary but severely acute) monopoly position in world petroleum supply. Efforts at reaching international agreement on a new world economic structure were underway at the time of this writing but the issue remains in doubt.

Atomic Energy

Atomic energy places such extreme demands on technology that its advance in competition with fossil fuels as a source of electrical energy has been slow. However, the manipulated rise in petroleum prices by OPEC and the complex environmental problems in the return to coal as a principal energy source are making atomic energy potentially more attractive for the future. This trend makes more and more difficult the maintenance of control over fuel elements and by-product plutonium to protect the world and its peoples against environmental insults and irresponsible conversion of plutonium into weapons. Since the early 1960s a principal goal of U.S. foreign policy has been prevention of nuclear proliferation. The economics of energy now places that goal in serious jeopardy. Scientific efforts to develop a safer form of energy from nuclear fusion are proceeding but the problem is one of great technical difficulty and the estimates of time to achieve success range from 20 to 50 years. Half a century of uncontrolled nuclear proliferation as a consequence of supplying electricity to mankind is a fearsome prospect.

Populations

The ultimate concern of all governments, in terms of both ends and means, is people. Of growing concern is the relationship between total available resources and population in the entire world, but especially in the most populous regions and those in which the rate of population increase is sharpest. Populations are significant in relation to resources of arable land and materials, ability to buy food, levels of consumption of all goods, rates at which environmental pollution occurs, and ability to extend governance. As populations increase, problems worsen in all these categories unless means are found to exert strong positive controls or motivations. In an interdependent world, population problems in any country have effects on all countries. Rates of population increase of different countries in the contemporary world tend to be in inverse proportion to achieved levels of development. Technology is available to feed large increases in populations as well as to control the rates of increase, but the enlistment of technology toward either purpose requires institutional support which is generally inadequate. Many forces are at work that cause population increases while few forces have been devised to inhibit population growth in poor countries, other than food deprivation as a consequence of food/population unbalance. International tensions resulting from population pressures are regarded as serious and worsening but international agreement on the resolution of the problem is lacking. The dilemma facing the world is that governments of poor countries call for aid from developed countries to secure the rights of their citizens to living standards achieved by developed countries, but cannot reconcile these expectations with their practical impossibility in the face of uninhibited increases of populations.

Food

As with population control, the limiting factor on food supply is not primarily technological but institutional. Wider exploitation of well-established technology of plant genetics, fertilization, storage, processing, and marketing could treble or quadruple the available food supply of the world. But the institutional remedies for the almost inevitable increase of famine conditions in the closing quarter of the 20th century must deal with food production and distribution as only one ingredient in a pattern of development that encompasses health and education, nonagricultural employment opportunities in urban and rural areas, stable currencies and international exchanges, land management reform, and stable institutions of government able to administer effective tax and investment programs. Failing achievement of these conditions, the poor countries will need to rely increasingly on imported supplies of food of which the United States is the leading exporter. For the United States the options include (a) short-term economic advantage by sales to the best market, (b) stern compulsion on the poor countries to effect reforms by deliberate choice of markets to reward the countries that do so, and (c) compassionate doling out of dwindling food reserves to populations on the basis of relative extremes of need. Averting so painful a decision rests not with the United States alone but with all potentially food-deficient countries as well. But if effective means of cooperation in development are not achieved, the ultimate decision will rest inescapably with the leadership of the most productive country, the United States.

Oceans

The status of the three-fifths of the globe covered by oceans was in question in the mid-1970s. Squabbles over fishing rights and seaward extent of national sovereignty were frequent. U.S. entrepreneurs impatiently waited for some sort of legal determination of seabed sovereignty and property rights in order to exploit emerging technologies for securing the petroleum and metallic wealth of this remaining frontier. Naval use of the international medium of the oceans remained a plausible exercise of national power, but question was being raised as to U.S. supremacy at sea, once taken for granted and now seriously challenged. Environmentalists were vocal in denunciation of Japanese and Soviet overfishing of the dwindling population of whales and of the pollution of the oceans by oil spills and chemical effluents. Failure of the maritime nations to agree on a new law of the sea in pending negotiations threatened to leave the ocean commons in a state of anarchy, instead of leading to a system of cooperation to maximize the management of the oceans as a sustained source of food and mineral wealth.

Resource Allocation

Consumption of minerals and fossil fuels is proportional to the level of economic development of nations, and levels of development differ greatly. Production of minerals and fossil fuels is related to their occurrence in the earth, and they are unevenly distributed among nations. Since extractive industries are first to be attempted by developing nations, the effect is that of a flow of materials from the poor countries to the rich, and a flow of processed goods from the rich countries to the poor. Efforts by poor countries to correct these evidently disadvantageous terms of trade have brought controversy into the United Nations and other forums. For all poor countries to reach the levels of materials consumption already achieved by the developed countries would far exceed the available reserves of the earth. Demands by the poor countries for a larger share of the benefits of the wealth from their mines and oil fields signal the need for eventual agreement among nations as to an equitable allocation of these resources. The wealth of developed countries is in the form of technology, management, a built industrial plant, and investment capital. It remains to be determined how much of a transfer of the technical resources of the rich nations to the poor will be acceptable, and how large a share of raw materials the poor nations will insist on retaining. Clearly, the developed nations will need to practice a greater conservation of imported resources and the developing countries will need to moderate their expectations of equaling the consumption levels achieved by the rich. There is simply not enough to go around. But by the mid–1970s, these constraints were insufficiently appreciated in either the rich or the poor countries. An attempt to ascertain the limits to growth, though usefully signaling an alert, had foundered on dubious assumptions while neglecting the practical question of how high a standard of consumption was achievable over the entire globe with its inexorably increasing population.

Multinational Corporations

In response to efforts by many foreign nations to protect their own balances of international exchange by restricting the penetration of foreign corporations, a form of international commercial institution has rapidly proliferated. This form, the multinational corporation or MNC, is designed to accomplish the age-old dream of the economist: to minimize the economic significance of national boundaries. It does help to alleviate once-potent economic causes of international disputes, and it can be an effective agent of technology transfer, but it also generates new causes of conflict and frustration. Characteristically, the MNC moves capital, materials, credit, managerial expertise, technological skills, intellectual property, and even trained labor from country to country in order to maximize its total overall and long-term profit. In the process it erodes the national sovereignty of host countries, diverts capital and labor from nationally planned economic allocations, and competes for economic and even political power, while preserving its own economic and technological power base remote from the countries it penetrates. At the same time, because of the complex and farflung nature of its operations, it tends to elude controls which the base country seeks to impose, or even at times to outpace the base country's perception that certain controls may be needed in its own national interest. In so doing it tends to neglect political, social, and institutional costs of its operations.

As an institution the MNC offers the capability of influencing constructively the evolution of a stable world economy and the development of lagging economies. But as the MNC currently operates, it excites resentment among U.S. labor unions as an instrument to cause unemployment at home; it excites resentment in developed countries by superimposing foreign management over domestic labor; and it excites resentment in developing countries by co-opting labor and resources to feed into technologies which are often inappropriate to, and tend to distort, the development process in those countries.

Nationalism

The disintegration of 19th century colonial empires has resulted in a large increase (to 171 in November 1975) in the number of separate sovereign states, each groping toward independence, governance, self-determination of national policy, and coherence. Some of these states have discovered the ancient formula whereby nationalism, in terms of a contrived hostility toward their own neighbors, toward other groupings of states, or toward one or another of the great powers, can serve to unify and promote coherence of their own political structures. At the same time, claims turn into "rights" and exchanges of values become "exploitation," creating an attitude of manifest destiny of the poor.

United Nations

Born in an epoch of hope for a cooperative world of peaceful nations, the United Nations has degenerated into a cockpit of parochial squabbles. Since the penalty for intransigence in the United Nations is inconsequential, the motive for compromise has disappeared and decisions without practical effect are arrived at in the U.N. General Assembly by counting the votes of the ministates. Effectiveness of the U.N. Security Council is largely nullified by exercise of the veto power by the leading permanent members. Constructive programs of the

World Bank and the World Health Organization offer a glimmer of hope but the intransigence evident in the General Assembly has found its counterpart in UNESCO and ILO. By the mid-1970s, respect for the United Nations in the United States had been seriously impaired and the cost/benefit of the association of nations was widely questioned. The very substantial contributions of the U.N. system were largely unseen while its futilities were highly visible. Whether public opinion would be content to tolerate this unsatisfactory state of affairs long enough to evolve a more workable and useful U.N. structure remained to be seen.

Regionalism

A basic building block available to U.S. diplomacy in the balancing of cooperation and conflict is the circumstance that many contiguous nations share common geographic and economic problems and opportunities. Many such multinational regions exist throughout the world but their effect on the nations that share them varies widely. Some, like the Scandinavian countries, have established cooperative relations; others, like the nations of former French Indochina, have a long history of strife; some, like the States of Central America, are groping toward cooperation; and some, like the Middle East, are fiercely divided by religion and ideology. The opportunity for economic and social benefits to such regions is great but largely wasted; cooperative planning, division of labor in the development and testing of useful technology, shared infrastructures, and the recognition of commonality of problems, opportunities, goals, and approaches, are all available as elements to reduce the economic significance of national boundaries. Reasons for the neglect of this opportunity to strengthen international amity are easy to find, but the want of effort to this end seems hard to justify.

Shrinking World Community

Instant global communications, verbal and visual, bring the whole world into the living room. A terrorist attack in the Middle East or Northern Ireland, an earthquake in Chile or Turkey, an election in Australia or Portgual, is described or shown minutes later everywhere else. The infinite variety of events inviting global attention overloads the receptors of the individual and the time or space of the communicators. Censorship is inherent, not only for reasons of national policy or economic advantage but because limited capacity compels selection according to some policy or principle. "Newsworthy" events—like war or unrest in Morocco, Angola, Belize, Ethiopia, Portugal, Cyprus, Lebanon, or elsewhere—are reported while crop statistics, new schools, technological developments, and other constructive events are ignored. Even so, the individual is told more than he can assimilate. Excessive demands are placed on his enthusiasm and indignation. In response, the individual tends to dismiss the information flow as irrelevant to his own interests, and to rely on the "experts" to deal with these hopelessly numerous and complex matters. Or else, in support of his own tradition or esthetic sense, the individual may seize on some one conflict as his own, choosing a side for reasons of moral predilection or ethnic, religious, or national origin. Even so, the average American in 1975 is more aware of the world outside his own country than ever before but perhaps more depressed by what he perceives.

Global Flows

Information on current events is only one of many kinds of flows that cross national boundaries. The entire globe is a complex network, bound together by systems of transportation and communication by land, sea, air, and electronic linkages. Almost all nations contribute to and receive these flows, and the traffic along the various media continues to grow. The flows include trained persons moving to new homes, students seeking further education, tourists learning about the world, business people looking for opportunities for profit, scientists seeking to exchange knowledge, and diplomats bent on facilitating the conduct of international relations. Transactional flows also take place, in the form of credit, materials and products, ideological views, information, diplomatic influence, and expressions of national interests and goals. Still other flows, ranging from highly destructive to something less than constructive, take the form of terrorist attacks, dissemination of weaponry, the international movement of dangerous drugs, the spread of disease epidemics, hostile signals and threats, guerrilla and "underground" movements, and covert operations. Encouragement and discouragement of various of these flows is the business of every government, some more than others. Together with the responses to them that feed back to the original source country, these flows aggregate into what is called "foreign relations." Since most flows are on the increase, it can be said that foreign relations are progressively intensifying for all countries. In the case of the United States, the indices of size, wealth, economic activity, military strength, and other measures of a dynamic society, are all surpassingly high; U.S. foreign relations are accordingly more intensive and complex than those of any other country in the world.

However, U.S. institutional mechanisms to manage, plan for, or even keep track of these increasing flows are not growing correspondingly. This fact suggests that the United States is less and less able to administer a more and more demanding responsibility for foreign policy. It is also probable that the same deficiency exists in other highly dynamic developed countries.

Disorientation

Rarely, if ever, has U.S. foreign policy faced so many fundamental changes—in the power base of its own political system, in the complexities of the external world, and in the challenges and obstacles to be met in furtherance of its goals. Disorientation is not too strong a term for the state of U.S. foreign policy in the mid-1970s.

At this point in the Nation's history it has just emerged from a tragic, divisive, and in the minds of many a futile, war. National attitudes are mixed toward further exercise of U.S. power and influence in the world, even to the revival of the isolationism of the 1930s. Domestic issues are most salient: concern for the deteriorating environment, resistance to the achievement of school integration through forced busing, worries over unemployment and inflation, apprehension over threatened shortage of energy.

A long list of disruptions abroad were also of public and official concern: the festering and periodically explosive Arab-Israeli conflict, the revolt of the Third World in the U.N. General Assembly, Third World economic challenges to prevailing patterns of commerce, periodically renewed concern over the global increase in populations relative to global food supply, assertions of nationalism and intransigence by the many new nations, incidents of bombing and terrorism around the world, hijackings and kidnapings, urban guerrilla movements in several countries, religious conflict in Northern Ireland and communal conflict in Cyprus and Lebanon, power shifts or active contests at many points in Eurasia and Africa, unease over proliferation of nuclear weapons and the stability of the nuclear deterrent, frustration over the issue of seabed sovereignty, growing awareness of the disintegration of the world monetary structure erected after World War II and of the possibility of world monetary collapse, and a general sense that national goals of the many old and new nations of the world were at cross-purposes.

The want of coherence and shared common purpose in the United Nations, the superpowers, NATO, and other groups of nations that once found opportunities for cooperation is a distressing characteristic of the contemporary world. It is a time for rebuilding and new leadership toward purposes that all can share. That is the prime challenge of American diplomacy in the final quarter of the 20th century.

III. SIX CASES ILLUSTRATING THE INTERACTION OF SCIENCE, TECHNOLOGY, AND AMERICAN DIPLOMACY

In the introduction reference was made to the original plan, outlined in *Toward a New Diplomacy in a Scientific Age*, to present a number of cases and issues to illustrate the interaction of science, technology, and American diplomacy, and in doing so to adopt a common format. Despite the widely differing circumstances of the 12 separate studies which followed, it did prove possible to achieve substantial structural parallelism in treating them. This parallelism is evident in the fact that virtually all of the studies contribute illustrations and insights to each of the 6 major operational issues presented below in sections V through X even though the topics of the 12 studies were not selected with these operational issues in mind. On the contrary, the operational issues were suggested by the independent analyses of studies as the series progressed.

The parallelism is also evident in the ease with which the commentaries on the various studies fit the somewhat arbitrary formats circumscribing all of them—one format for the six cases and a variation of it for the six substantive issues.

The format for the six cases is given herewith, followed by the commentaries on the cases themselves:

Statement of the case
Importance of the case
How the case developed
U.S. involvement
Role of Congress
Outcome
Assessment
Author's reassessment in 1975
Some illustrative questions

CASE ONE—THE BARUCH PLAN: U.S. DIPLOMACY ENTERS THE NUCLEAR AGE[8]

Statement of the Case

The proposal to internationalize the control of atomic energy presented by U.S. negotiator Bernard M. Baruch on June 14, 1946, at the opening session of the United Nations Atomic Energy Commission, was the first major postwar step toward coping with a foremost technological threat to future world security. Despite widespread recognition of the dimensions of the threat,[9] the negotiations on the Baruch proposal ended in failure and the threat continues to grow.

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[8] U. S. Congress, House, Committee on Foreign Affairs, *The Baruch Plan: U.S. Diplomacy Enters the Nuclear Age*. Prepared for the Subcommittee on National Security Policy and Scientific Developments by Leneice N. Wu, Foreign Affairs Division, Congressional Research Service, Library of Congress, Washington, U.S. Government Printing Office, 1972, 67 pages.

[9] Two Americans whose reaction to the threat when it first became known was essentially optimistic may have been representative of many others. One, a military officer who was present at the Alamagordo test of the first atom bomb, was heard to remark, with pardonable rhetoric: "At last war has devoured itself." The other, the associate director of this study—then a U.S. Navy Japanese Language Officer assigned to military government duties on Tinian, near the airfield from which the bomb dropped on Hiroshima (August 6, 1945) was flown—wrote to his wife on August 8, 1945, that the development of "this terrifying new weapon" could be seen as strengthening the prospects for world peace, because of the strong possibility that "when a certain point was reached in the degree of devastation that war is capable of causing, that knowledge would act as a deterrent to war and would do so increasingly as modern weapons increased in power. The debut of [the atomic bomb] seems to me to mark that turning point."

To the extent that this reaction of characteristic American optimism may have been shared by those making policy, however, it seems clear in retrospect that it was a hazardous one which took for granted the difficult negotiations, spurred by a supreme sense of urgency, upon which the achievement of a reliable state of deterrence would have to depend. Thirty years later it is by no means certain whether "that turning point" has actually been reached.

Importance of the Case

The arrival of atomic power was a technological event of unparalleled significance for international affairs. It raised the cost of all-out warfare to an intolerable level and substantially altered the basis for the positions of diplomats at the bargaining table. The problem of how to establish control over both military and peaceful uses of atomic energy posed an unprecedented challenge to world diplomacy. At the outset, the technological necessities of effective international control were politically unacceptable, especially to the Soviet Union. For U.S. diplomacy the problem, seen in retrospect, was a test of ability first to establish an atmosphere of confidence despite differing political goals, then to fashion a step-by-step control program, keyed to common interests, which could serve as a basis for productive negotiation. From the perspective of the Science, Technology, and American Diplomacy study series, it was a major test of the capacity of the United States to use its scientific, technological, and diplomatic expertise in concert to solve a crucial world problem.

How the Case Developed

Once the use of atomic energy for destructive purposes had been demonstrated to the world, the Truman Administration acted to create public understanding of the bomb and its significance for the United States. The Smyth report, containing a great deal of previously classified, basic scientific information, was released in August 1945; the President took initial steps toward enunciation of U.S. atomic energy policy in two major addresses in October. On November 15 the United States, Canada, and the United Kingdom laid a foundation for international action to control atomic energy in the Three Nation Agreed Declaration.

In December the Soviet Union was made a party to the endeavor in the signing of the Moscow Declaration. Earlier that month Assistant Secretary of State Dean Acheson had been appointed to head a committee to report to the Secretary on U.S. policy for international control. In January 1946, the United Nations Atomic Energy Commission (UNAEC) was created, and a Board of Consultants headed by TVA Chairman David Lilienthal was formed to assemble technical advice for the Acheson committee. The findings of the Acheson committee and the Board of Consultants (which came to be known as the Acheson-Lilienthal report) were released in March 1946. In the same month, Baruch was appointed to represent the United States in the UNAEC.

The plan which Baruch presented to the UNAEC on June 14, 1946, was a combination of his own ideas on international control of atomic energy and the proposals of the Acheson-Lilienthal report. A central feature of the plan was an international organization to which would be entrusted all phases of the development and use of atomic energy. The plan also called for inspection and for making violations of the control agreement subject to punishment, and a proposal that the veto power in the Security Council would not apply in voting on sanctions. In a counterproposal on June 19, the Soviet Union rejected the idea of waiving the veto and urged a total prohibition of atomic weapons, promotion of peaceful development of atomic energy, and agreement on international control but with retention of full sovereign freedom of action. However, Soviet negotiators stopped short of suggesting an actual procedure. There was thus from the outset a wide gulf between the U.S. plan and the Soviet approach, a gulf that never appreciably narrowed.

The work of the UNAEC proceeded for less than 4 years; a majority plan based on the U.S. proposals was accepted, 40–6–4, in a nonbinding U.N. General Assembly resolution, but rejected (by Soviet veto) in the Security Council; by November 1949, the work of the UNAEC had waned to the point where the General Assembly agreed to suspend its activities.

U.S. Involvement

As suggested above, President Truman sought at the outset to develop a broad base of understanding and participation in the process of achieving international control of atomic energy. Secretary of War Henry L. Stimson, asked by Truman to appoint a group to consider both domestic and international control needs, brought leading scientists together with key Government officials in the Secretary of War's Interim Committee in May 1945. Vannevar Bush, eminent scientist-engineer-administrator, and General Leslie Groves, head of the Manhattan project which had developed the atom bomb, were members of the Acheson committee formed in December 1945, along with Harvard President James B. Conant and former Assistant Secretary of War John McCloy. The Board of Consultants appointed to advise the committee consisted of TVA Chairman David Lilienthal, New Jersey Bell Telephone Co. president Chester Barnard, Manhattan project participant Harry A. Winne (an engineer and a vice president of the General Electric Co.), and physicist J. Robert Oppenheimer, who had directed the Manhattan Project weaponry installation at Los Alamos. The Acheson-Lilienthal report which resulted from meetings of these two groups identified the basic technological factors that would affect the development of an international control system and outlined a control plan governed by those factors.

The delegation named to present the U.S. position to the United Nations was of a different character. With financier Baruch were three leading bankers, the head of the New York State Racing Commission, and a scientific adviser who had served in that role with General Groves. Baruch contributed a reputation for political acumen: it was apparently hoped that he could help enlarge the administration's freedom of action in international negotiations because he had the confidence of Congress, which was concerned about giving away secrets and thereby undermining the U.S. strategic position.

There appear to have been significant differences in perspective between those who developed the recommendations for a policy of international control of atomic energy, representing mainly a technical approach, and those who were responsible for conducting the diplomatic negotiations to implement the emerging policy. In any case, contact between the Baruch delegation and the Acheson-Lilienthal groups ended after a few meetings. There was fault on both sides: Baruch resented open publication of the Acheson-Lilienthal report; he asserted that he would introduce his own ideas into the negotiations and conduct them in his own way; the members of the Acheson committee and the Board of Consultants declined to serve under Baruch, partly on the grounds that they wanted to retain the right to speak out in opposition if Baruch pursued policies with which they disagreed.

Role of Congress

Congress played no direct role in the negotiations but exercised a restraining influence. At the time of the December 1945 conference which resulted in the Moscow Declaration, Senator Arthur Vandenberg, Chairman of the Senate Foreign Relations Committee, and other Members of Congress repeatedly sought and received assurances from the President that the United States would not release atomic energy information before adequate safeguards were established. This protective attitude was heightened by the revelation in early 1946 of evidence of espionage activities in Canada involving the transmission of atomic energy information to the Soviet Union.

Outcome

The collapse of the Baruch plan negotiations was a costly diplomatic failure. It would be idle to speculate on the consequent diversion of resources from peaceful uses to armament expenditures. More consequential still is the question of how the pattern of cooperation established through a diplomatic success in this critical problem area might have altered the course of postwar political developments. Decisive agreement on an international control system might have put an end to the uncertainty which has prevailed ever since: the paradoxical uncertainty of escalating military power in conjunction with waning security.[10] Further, an early agreement might have laid the groundwork for the development of peaceful applications of nuclear energy almost a decade earlier than it in fact occurred, and on a wider scale—thereby, among other things, possibly heading off or making more manageable the present complex economic, energy, and diplomatic situation with respect to oil. But apart from the uses of nuclear power itself, a successful conclusion to the Baruch plan negotiations could have provided an influential precedent—somewhat as the IGY did a decade later, but in a more direct intergovernmental context—for the acceleration of international cooperative activity of many kinds. It is conceivable, in short, that it might have averted or mitigated the course of the Cold War.

Assessment

What were the reasons for the failure? One way of summing them up is to concede that the American political leaders and scientists involved did not bring to bear the vision and persistent effort demanded by a problem of this extraordinary nature and magnitude. In more specific terms, some of the elements of the failure were the following:

—There was a basic contradiction in the U.S. negotiating position. The United States had demilitarized in haste after World War II, whereas the Soviet Union had maintained very substantial forces in combat readiness. This factor argued for retention of the U.S. monopoly of atomic weapons as long as possible—a consideration that was as much in the minds of the Soviet leaders as it was a concern of the administration and the Congress. Yet the American leadership realized, and stated publicly, that the secret could not be kept for long. Therefore, it was necessary to move quickly and comprehensively to establish international controls. Paradoxically, the U.S. approach—in particular, the fact that the United States repeatedly asserted its intention of relinquishing atomic weapons but never reached the point of defining the conditions and timing of what it would consider acceptable controls—appears to have underlined the U.S.S.R.'s suspicion that it was the American purpose to retain essential control while giving the appearance of vesting it in an international body.

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[10] Various observers have commented on this paradox. Testifying before the Senate Foreign Relations Committee on August 26, 1973, Dr. Herbert York—Chancellor of the University of California at San Diego, and previously Director of Defense Research and Engineering—noted that "ever since shortly after World War II, the military power of the United States has been steadily increasing; over the same period the national security of the United States has been rapidly and inexorably diminishing." (*Technical Information for Congress*, p. 220.) On May 14, 1968, Secretary of the Air Force Harold Brown declared: "There can be no successful aggression by means of strategic war today." (*The Evolution of International Technology*, p. 20.) Earlier, in 1957, Dr. Henry Kissinger had written in *Nuclear Weapons and Foreign Policy:* "The destructiveness of modern weapons deprives victory in an all-out war of its historical meaning." (*Ibid.*, p. [illegible]9)

—There was calculated ambiguity in the Soviet position. Genuinely suspicious of the United States, the U.S.S.R. substituted statements of principle for concrete plans while it continued its own atomic weaponry program which was to prove much further advanced than most American scientists and diplomats suspected at the time. In retrospect, the fact of understandable—and at least partly justified—Soviet suspicions may argue that the United States should have adopted a more conciliatory, patient, and persistent negotiating posture.

—Certain features of the U.S. proposals which some considered essential to an effective control system—notably those concerning limitation of national sovereignty, inspection, and waiver of veto in the Security Council in matters of punishment for violations of a control agreement—were totally unacceptable to the Soviet Union. The question arises as to whether these points were in fact essential to a control plan and as to the extent to which they prevented meaningful negotiation. A possible alternative approach in the U.S. policymaking process might have been first to determine what among the basic technological and political requirements of an effective control system each side would accept, and then try to establish some common ground between the two positions. A willingness to proceed on this basis might at least have emphasized good faith and signaled an understanding that each side had its special political problems to resolve.[11]

—There were conflicts in the relationships and respective roles of the American scientists and diplomats. Although the diplomats carried the action, with the scientists in a limited advisory role, it was the technology of atomic energy which set the scope and tone of the negotiations. Disagreements were couched in technological terms. Actually, they reflected political differences, but the diplomats failed to deal with them accordingly. At the same time, scientists who were in a position to influence policymakers in the United States and in the UNAEC failed to recognize the problems of feasibility of control in the context of emerging post-war political relationships.

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[11] On the other hand, it is of course possible to speculate that nothing could have induced the Soviet leaders to compromise on what they considered key issues, as long as (a) the U.S.S.R. lacked atomic weapons and therefore remained in a weak bargaining position, and (b) the leadership believed it either certain or strongly possible that the U.S.S.R. would soon develop its own atomic bomb.

One of the factors which set the stage for failure was the overestimation by U.S. leaders of the tactical advantage which monopoly possession of atomic weapons gave the United States.[12] As the author, Leneice N. Wu, observes:

> While exclusive possession of a new technology stemming from a scientific discovery may give a nation an advantage in international affairs, that advantage is likely to shrink quickly. In the case of nuclear energy, the principal disadvantaged country was able to duplicate the discovery of fission and to create a rudimentary initial technology sufficient to permit detonation of a nuclear device while the negotiations were still in progress. Yet during this time U.S. negotiators apparently assumed that secrecy could preserve their advantage for a comfortably long period of diplomatic accommodation. Thus [one] lesson from this study is that it is unrealistic to rely on secrecy, once the application of a new technology has been forcefully demonstrated before the world as in the case of the atomic bombs, to prevent other nations from acquiring or recreating this technology.[13]

Whatever the reasons for failure of the Baruch plan negotiations, they were characterized by insufficient teamwork and discontinuous involvement of technologists in the diplomatic process. Possibly Presidential and congressional encouragement of a continuing dialog between the Baruch delegation and the Acheson-Lilienthal groups could have helped to shape a U.S. position capable of contributing to a successful conclusion of the negotiations. But existing procedures and impetus were inadequate for dealing with the impact of a technological development of this size and complexity.

GENERAL LESSONS FROM THE STUDY

This study of the Baruch plan negotiations suggests some general observations about the interrelationships of Science, Technology, and American Diplomacy. Among those noted by the author are the following:[14]

—The creation and application of new technologies may so change relations among nations that a system of international control becomes desirable. Although probably the most dramatic example to date, nuclear energy is neither the first nor the last example of a technological innovation which suggests the need of international machinery and procedures for controlling it. (Some others are aviation, warships, supertankers, and communications satellites.)

—Intense rivalries among different national interests may nevertheless tend to prevent the achievement of an appropriate international control system. "Not even an awareness of the awesome destructive force of the atomic bomb provided sufficient incentive to nations to agree on a secure form of control over atomic energy."

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[12] Another contributing factor was the pervasive lack of understanding of the facts of atomic technology which prevailed at the time. The project director of this study series observes that after 30 years of exposure to atomic technology it is hard to recall how little was generally known about the subject in 1945. For even a literate observer of the political, military, and technical developments of that time, it took several readings of the Smyth Report to get the full import of the technology. It is unlikely that many Washington bureaucrats gave it as much as a single thorough reading. An informal random poll of 30 Washington professionals—mainly government—taken a few weeks after the Smyth report had been released and at a time when it had been much in the news, yielded only one person—a chemist—who had read it. This same source remarks that in a conversation he had at this time with General Groves, the director of the Manhattan District expressed complete confidence that the Soviets could not possibly produce an atomic weapon for at least 20 years.

[13] Wu, *The Baruch Plan: U.S. Diplomacy Enters the Nuclear Age*, p. 64.

[14] *Ibid.*, p. 63–67.

"—While exclusive possession of a new technology . . . may give a nation an advantage in international affairs, that advantage is likely to shrink quickly."

Once a new technology has been demonstrated it is unrealistic to suppose that the secrets of how it is created can be kept for more than a very short time.

—For scientists and technologists to work effectively with diplomats toward the solution of complex political problems with important technical components, "the members of each field must express their respective points of view fully and in terms which can be understood and applied by members of the other field. At the same time, there must be a special receptivity by members of each field and a special willingness to accommodate to the outlook of the other, in order to attain the ultimate goal."

—Where the technological and political realities which must be harmonized are in sharp conflict, a special effort is required of negotiators to see that all of the requirements to be reconciled are fully analyzed and taken into account. In the Baruch Plan negotiations, the dominant political reality was that an assurance of the end of the serious threat to Soviet military security posed by U.S. possession of the atomic bomb would have been necessary in exchange for renunciation by the U.S.S.R. of its own efforts to develop a nuclear weapon and accept international control. The dominant technological reality was that the processes associated with the peaceful and military uses of atomic energy were approximately the same. "And it appeared from the outset that the security of a control system would have to be maintained through inspections of an exceedingly intrusive character. The Soviet Union was faced with this peculiar attribute of the technology of atomic energy which weighed heavily on the choices of a control system and which seriously challenged the closely guarded society of that country. To the United States, a major consideration . . . was how to penetrate the rigid secrecy of the Soviet Union in order to prevent or detect its expected violation of the control system . . . The negotiations neglected to reconcile [the respective national security requirements of the two countries] with these dominant technological and political factors of atomic energy in order to attain adequate and acceptable international control."

—Perhaps a guiding assumption among policymakers and negotiators alike was that the technological necessities of effective control would force acceptance of that control. But in reality, the drive to devise effectiveness in the control system seems to have ignored, if not to have defied, the need for special diplomatic efforts to achieve acceptability. "The area of acceptability received little if any consideration in U.S. policy discussion." Underpinning the U.S. approach were "a moralistic attitude which characterized the U.S. negotiating technique, arrogance generated by the notion of U.S. leverage, or prejudice toward Soviet science and technology. . . ."

—In summary: "It is clear that while science and technology alone could devise a control system which would be efficient in its task, and diplomacy could provide the fundamentals for an effective system to protect national security, only a combination of the elements from science, technology, and diplomacy could be expected to devise a workable system for control which would be acceptable to the leading nations of the world."

Author's Reassessment in 1975

The author of the study makes the following comments 3 years after the study was completed (summer 1972):

There appears to have been a general acceptance by Congress of Baruch as a competent negotiator in this area, an acceptance which might not be as forthcoming today. The question is still relevant: to what extent does Congress have a voice in, or can it effectively raise questions regarding, the selection of a chief arms control negotiator? In retrospect, and in light of developments since 1946, it would seem appropriate for Congress to intensify its efforts to insure that persons nominated for such critical diplomatic assignments as the negotiation of arms control agreements were not unduly subject to a particular professional, bureaucratic, special-interest, or other bias.

NEED FOR CONGRESSIONAL INVOLVEMENT

Although Congress had expressed an anxious determination to retain the "secret" of the atomic weapon—a goal which has since proven impossible—there was little congressional involvement in the Baruch plan negotiations. Was the reluctance in Congress during 1974 [15] to transfer peaceful nuclear technology similarly based on the notion that blocking this action would prevent the spread of weapons technology? There is a greater need now than ever for Congress to become intimately familiar with facts of nuclear technology, its military and peaceful uses, and the vital question of accelerating proliferation versus international controls.

However, the issue of controlling nuclear energy presents a much more complex set of circumstances now than it did in 1946. Congress is called on to understand defense needs in the field of increasingly complex and costly strategic weapons. Current arms control negotiations, especially SALT, require congressional decisions to support or reject a specific arms control program. In the face of growing demands for peaceful uses of nuclear energy to overcome the energy shortfall in many parts of the world, and with the offers of U.S. nuclear assistance to Egypt and Israel last year and the addition of India to the nuclear club, Congress has seen the need for, and sought, solutions to the problems of nuclear proliferation.

Further, in relation to such developments as the Vladivostok accords,[16] Congress will increasingly be called on to make timely political and technical judgments contributing to U.S. decisions to accept or reject successive international arms control agreements. Nevertheless, the question remains as to whether Congress is doing all it could and should do to come to grips with this greatest of contemporary problems of the interface of science, technology, and diplomacy.

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[15] As Wu states in a chapter on Arms Control and Disarmament in *Congress and Foreign Policy: 1974* (prepared for the Committee on International Relations, U.S. House of Representatives, by the Foreign Affairs Division, Congressional Research Service; Washington, U.S. Government Printing Office, April 15, 1975, p. 23): "A major issue in the Congress [in 1974] arose over the offer of U.S. assistance in the field of nuclear technology to both Eygpt and Israel, during President Nixon's visits there in June. The primary concern in Congress was the arms control implications: whether safeguards were adequate to prevent diversion to weapons use, and whether such moves might contribute ultimately to the proliferation of nuclear weapons. These fears were reinforced by the peaceful explosion of a nuclear device in May by India, using nuclear material provided through an agreement with Canada for cooperation in peaceful uses." The author adds that congressional concern for control was eventually translated into a number of different pieces of legislation.

[16] I.e., the agreement in principle signed by President Ford and Soviet party leader Brezhnev at Vladivostok in December 1974. The two leaders agreed to numerical ceilings on the offensive weapons systems of each country. The SALT teams of negotiators of both countries were to attempt to translate the statement into a treaty by late 1975, when Brezhnev was scheduled to visit the United States, an event which had been postponed several times. [As of April 1976 neither the treaty nor the visit had materialized, but the negotiations were still in progress.]

Some Illustrative Questions

Cases One and Two of the Science, Technology, and American Diplomacy study series both deal with the question of control of nuclear energy. The foregoing analysis of Case One poses important questions for Congress. However, because *The Baruch Plan* deals with an early stage in American diplomatic experience with nuclear technology, and because the basic issues and their implications were more full explored in the decade between the Baruch Plan negotiations of 1946 and President Eisenhower's "Atoms for Peace" initiative and related legislation of the mid-1950s, the questions suggested by this study are combined with those following the analysis of Case Two. (See pp. 42–45.)

CASE TWO—COMMERCIAL NUCLEAR POWER IN EUROPE: THE INTERACTION OF DIPLOMACY WITH A NEW TECHNOLOGY[17]

Statement of the Case

A second major U.S. diplomatic initiative in the post-World War II effort involving foreign policy and atomic energy was President Eisenhower's "Atoms for Peace" proposal, conveyed in a speech to the United Nations General Assembly on December 8, 1953.[18] This time the emphasis was on nonmilitary applications, but the underlying goal remained the same: to avert atomic military buildup by diverting nuclear materials to peaceful uses, and to provide a forum for some cooperation between the United States and Soviet spheres of influence.

The new initiative was successful in furthering the development of peaceful uses of atomic energy, thereby serving a secondary U.S. policy objective. Whether, on balance, it contributed to the primary aim is less evident, for the nuclear arms race continued at a frightening pace. At best, it may be said to have helped establish patterns of international cooperation and formal agreement on controls and safeguards which might some day carry over into the area of military applications. At worst, it may be judged to have encouraged nuclear technology transfer, without first achieving reliable international safeguards, to the point at which responsible nations adhering to the Nuclear Nonproliferation Treaty may one day—perhaps soon—be subject to pressures to withdraw and make their own bombs as defense against nonadhering nations. Proliferation of nuclear power technology and industry also increases the possibility that outlaw groups will come to possess nuclear arsenals.

Importance of the Case

The Baruch Plan of 1946 had failed to achieve agreement to arrest the development of a nuclear arms race before it could get started. By the time of the Eisenhower "Atoms for Peace" message the

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[17] U.S. Congress, House. Committee on Foreign Affairs, *Commercial Nuclear Power in Europe: The Interaction of American Diplomacy With a New Technology*, a study in the series on Science, Technology, and American Diplomacy prepared for the Subcommittee on National Security Policy and Scientific Developments by Warren H. Donnelly, Science Policy Research Division, Congressional Research Service, Washington, U.S. Govt. Print. Off., 1972, 163 pp. (committee print).

[18] *Ibid.*, p. 21.

Soviet Union had assembled its own stockpile of Hiroshima-type atom bombs and had successfully tested a hydrogen bomb. Meanwhile, several "People's Republics" had been established in Eastern Europe and China, South Korea had been invaded, attempts to form a European Defense Community had not worked out, and international disarmament negotiations were deadlocked.[19] Moreover, the Kremlin had pressed a vigorous and considerably successful diplomatic and propaganda offensive to persuade the world that nuclear weapons were not decisive, that they nevertheless were especially horrible and should be banned, and that the U.S.S.R. was prepared to take the lead in developing nonmilitary applications of atomic energy.[20] The principal U.S. reaction to the frustrations of this period of strategic setbacks and declining nuclear advantage was to threaten massive retaliation with nuclear weapons against Communist aggression.

Another reactive policy was the "Atoms for Peace" proposal. "Within the United Nations, the response . . . was instantaneous and favorable. The speech was scored as a victory for the United States in international affairs by undercutting a persuasive Communist propaganda offensive. . . ."[21]

Historically, the proposal represented a unique and constructive attempt to shift the emphasis in utilizing a significant new technology away from its military potential and toward its peaceful applications:

> It signaled the start of U.S. diplomatic efforts to create an international atomic energy agency; American encouragement to two European regional, multinational agencies for nuclear energy; establishment of a network of bilateral agreements between the United States and individual nations for technical assistance in nuclear energy; and a treaty to establish international safeguards over nuclear fuel materials. These diplomatic ventures sought to foster civil use of nuclear energy abroad, ranging from applications of radioisotopes for research and for diagnosis and treatment in medicine to the demonstration of nuclear power for the generation of electricity. Underlying the publicized, idealistic purpose of sharing U.S. nuclear science and technology were pragmatic, practical considerations of advantages to the United States.[22]

In the most consequential way, probably, of any of the 12 studies in the Science, Technology, and American Diplomacy series, this case (together with the preceding one on the Baruch plan) raises questions as to what diplomatic courses of action in fact are, in the long run, most advantageous to the U.S. national interest in dealing with a potent new technology.

How the Case Developed

The international activity most directly associated with atoms for peace is the International Atomic Energy Agency (IAEA). It was established July 29, 1957, as an international organization within the framework of the United Nations. It continues to report annually to the U.N. General Assembly and, on occasion, to the Security Council and the Economic and Social Council.

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[19] *Ibid*, p. 20.

[20] Henry A. Kissinger. *Nuclear Weapons and Foreign Policy*. New York, published for the Council on Foreign Relations by Harper & Bros., 1957: pp. 363-364.

[21] Donnelly, *op. cit.*, pp. 21-22.

[22] *Ibid*, p. 20.

PURPOSES OF THE IAEA

In his December 1953 message, President Eisenhower had proposed an international body with four main purposes: encouraging worldwide investigation into peaceful uses of fissionable materials; cutting back on atomic weapons stockpiles; advertising to all nations the desire of the great powers to satisfy human aspirations rather than build up armaments; and opening up a new channel for peaceful discussion of the many difficult problems facing the world. What resulted after more than 3 years of negotiations was an international statute which specified the following qualified goal for the IAEA:

> The Agency shall seek to accelerate and enlarge the contribution of atomic energy to peace, health, and prosperity throughout the world. It shall insure, so far as it is able, that assistance provided by it or at its request or under its supervision or control is not used in such a way as to further any military purpose.

Dr. Donnelly comments: "As 'military purpose' is nowhere defined in the statute, the mission of the International Agency is general enough to accomplish as little or as much as the member nations might desire".[23]

The IAEA was expected to develop a system of international safeguards for nuclear materials. This most difficult issue posed the dilemma of satisfying the general demand for a credible system of inspection and control in the face of the reluctance of the nonnuclear nations to surrender any sovereign rights to permit inspection by an international agency. The Soviet Union took the side of sovereign rights and has since continually opposed international inspection.[24] The final compromise reached was to restrict safeguards to IAEA projects and projects voluntarily placed under the IAEA safeguards system.

EUROPEAN REGIONAL ORGANIZATIONS

The two European regional organizations directly and indirectly influenced in their origins by the Atoms for Peace initiative were the European Atomic Energy Community (Euratom) and the Nuclear Energy Agency (NEA) of the Organisation for Economic Co-operation and Development (OECD). (The latter, originally known as the Organisation for European Economic Co-operation or OECC, includes in its membership the United States, Canada, and Japan.)

Euratom was established by the Treaty of Rome, signed on March 25, 1957, to further development of nuclear power in the European Economic Community—France, Italy, West Germany, Belgium, the Netherlands and Luxembourg. An underlying broader goal was economic integration of Europe. Setting out ambitiously to create a European nuclear technology and power industry, the Community sought the advice of outstanding European technologists. The result was a report, "A Target for Euratom," which "combined the factors of energy and economic policy into a compelling argument for European atomic integration."

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[23] *Ibid.*, p. 48.

[24] Departing from this position only briefly in 1963 at one stage of the negotiation of the Limited Nuclear Test Ban Treaty. How far the U.S.S.R. proposes to depart from this principle with respect to the ongoing negotiations on extending the scope of the test ban, while also providing for peaceful uses of nuclear explosions, remains to be seen.

> With the Suez Crisis still fresh in mind, [the authors] observed that a future stoppage of oil could be an economic calamity for Europe, and that excessive dependence upon an oil supply from an unstable region might lead to serious political trouble throughout the world. Estimating that future energy requirements of the economic community would increase by 83 percent between 1955 and 1975, they advised that the economic growth of the six countries was in danger of being seriously hampered by lack of another source of energy.[28]

Euratom quickly ran into diplomatic difficulties. The Soviet Union opposed both it and the European Economic Community, labeling Euratom a scheme for the rearmament of Germany with atomic weapons and charging that both organizations were instruments of NATO. The six European nations disregarded Soviet threats and an accompanying Soviet plan for Pan-European economic and atomic energy integration. However, there were other problems; for example, Euratom failed to win necessary support for building facilities to manufacture enriched uranium—considered by European proponents a top-priority feature of an independent program—but was obliged instead to buy enriched uranium from the United States. Further, of the 5-year research programs provided for by the Treaty of Rome, the first (1958–62) was largely limited to building an organization; the second (1963–67) was characterized by dissension and budget troubles; and the third (proposed for 1968–72) was not even approved—Euratom's research program has since been funded annually. Euratom did not produce a nuclear industry for the Community, but rather faces competition from the national industries of its members.

The Nuclear Energy Agency of the then OECC was, like Euratom, a response to European fears of a fuel shortage. The NEA was established by an international statute effective February 1, 1958, with the assigned objective of furthering "the development of the production and uses of nuclear energy for peaceful purposes by the participating countries." Like its parent OECD, the NEA is a forum rather than an operational agency. As Dr. Donnelly puts it, ". . . its strong point has been coordination and program [review] rather than direct operation. The Agency has led its members into agreements on radiation health and safety standards, and on nuclear insurance. By contrast, Euratom is an operating organization as well as an agency involved in establishing an industrial structure for nuclear power in Europe."[29]

NON-PROLIFERATION TREATY

The most recent major diplomatic consequence of the scientific discovery of fission was the negotiating of the Treaty on Non-Proliferation of Nuclear Weapons (NPT), which entered into force March 5, 1970. The concept of the treaty was a radical one: it divided nations into two classes, those which had the atom bomb and those which did not; and it committed the non-nuclear-weapons parties to relinquishing their sovereignty to the extent of permitting inspections on their territories by international inspection. In return, the nonweapons parties received assurances through a separate U.N. resolution[27] of certain protective measures by the parties possessing nuclear weapons. The treaty also provided for a system of bilateral safeguards agreements between the nonweapons countries and the IAEA. At the same time, it obliged nuclear weapons parties not to transfer nuclear weapons to other countries, to share the benefits of nuclear energy with the other parties, and to support the efforts of the IAEA to develop an effective safeguards system.

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[28] *Ibid.*, p. 74.
[29] *Ibid.*, p. 110.

U.S. Involvement

As the first country to tap nuclear energy, and for a time the sole possessor of the atom bomb, the United States was the principal force behind virtually all of the early efforts to control and harness the atom. It was the source of some constraints, however, as well as positive support for the pursuit of these goals.

U.S. SUPPORT OF IAEA

U.S. officials worked hard to achieve the establishment of the International Atomic Energy Agency and, initially, to endow it with real powers. Despite the limited goals finally agreed upon for it, the official U.S. position heralding it was optimistic. Secretary of State John Foster Dulles assured the Senate Foreign Relations Committee that the United States had achieved its diplomatic objective and gained the widest possible international support for the new agency, which would (among other things) provide a forum for the exchange of information about nuclear energy discoveries, provide an effective system of safeguards, enhance nuclear health and safety, strengthen control of nuclear weapons, reduce pressure for proliferation, and improve the climate of international relations. At the same time, Secretary Dulles promised that the Agency would not be a "giveaway organization" for U.S. atomic secrets or nuclear fuel materials, and that U.S. assistance to and through the Agency would not constitute a subsidy to commercial nuclear power in Europe.

When the Congress authorized U.S. participation in the IAEA, the U.S. Atomic Energy Commission had had almost 3 years of experience with bilateral agreements to foster the civil use of nuclear energy. These agreements involved assistance to some 40 countries; most were for nuclear research, a few for nuclear power. The State Department at first advocated channeling such assistance through the IAEA as a step toward achieving international agreement on common standards for safeguards and gaining acceptance of inspection—in the belief that nations would more readily accede to supervision by inspectors from an international agency in which they participated than by those of another nation. However, the insistence of AEC Chairman Lewis Strauss that the United States should not abandon its bilateral agreements deprived the new agency of an important source of strength.

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[27] These assurances were not embodied in the text of the treaty itself. "Non-nuclear-weapons states sought guarantees that renunciation of nuclear arms would not place them at a permanent military disadvantage and make them vulnerable to nuclear intimidation. But, it was argued, the security interests of the various states, and groups of states, were not identical; an effort to frame provisions within the treaty that would meet this diversity of requirements—for unforeseeable future contingencies—would create inordinate complexities. To resolve the issue, the United States, the Soviet Union, and the United Kingdom submitted . . . a tripartite proposal that security assurances take the form of a U.N. Security Council resolution, supported by declarations of the three powers. [The declarations were duly made and the resolution was passed, with France abstaining.] The resolution, noting the security concerns of states wishing to subscribe to the Non-Proliferation Treaty, would recognize that nuclear aggression, or the threat of nuclear aggression, created a situation requiring immediate action by the Security Council, especially its permanent members." U.S. Arms Control and Disarmament Agency. *Arms Control and Disarmament Agreements: Texts and History of Negotiations.* Washington, D.C.; U.S. Govt. Print. Off., February 1975, p. 83.

The IAEA's first Director General, W. Sterling Cole—who had resigned the chairmanship of the Joint Committee on Atomic Energy to take the post—tried to structure the Agency as a channel for atomic energy aid and as a proponent of international safety standards and international controls for nuclear fuel materials. The United States did not respond to his vision of a strong international agency. In 1961 the State Department, in agreement with the AEC, established an Advisory Committee chaired by Dr. Henry D. Smyth—author of the postwar "Smyth Report"—to conduct a general review of the IAEA. The Advisory Committee urged that the IAEA be strengthened under U.S. leadership and that more U.S. nuclear energy aid be channeled through the Agency rather than bilaterally. The State Department and the AEC rejected the Advisory Committee's recommendations, preferring that the IAEA limit itself to such technical service functions as international safeguards and inspection.

U.S. RELATIONSHIP TO EURATOM AND NEA

U.S. backing of Euratom, as of the IAEA, was mixed. Secretary Dulles made clear "that the United States wanted Euratom to concentrate exclusively on development of nuclear power and not aspire to such greater goals as the economic welfare of the European Community or the fostering of greater political unity among its member states. While some European proponents of Euratom looked to it to restore the influence of the six nations in world affairs, the Washington view was the opposite." [28]

Three major issues central to the establishment of Euratom were whether it should manufacture enriched uranuim, whether member states should be precluded from military use of atomic energy, and whether Euratom should have a monopoly over nuclear materials.

For security reasons, the United States opposed foreign production of enriched uranium, and retained its monopoly by guaranteeing an adequate supply to Euratom at reasonable prices. The idea—derived from the Atoms for Peace concept—that Euratom could serve to prevent nuclear armament in Europe was stillborn because of French insistence on the right to produce and use atomic weapons for national security. Yet the French pressed successfully for a Euratom monopoly of nuclear supplies for commercial purposes. By pointing to the U.S. example in the Atomic Energy Act of 1946, which took title to all nuclear materials in the Nation and forbade private ownership, the French prevailed over West German opposition to nuclear monopoly as incompatible with the principles of a free-market economy.

The United States did participate with Euratom in a joint power program, using U.S. nuclear technology, which resulted in the construction of three operating nuclear powerplants with a combined output of about 600 megawatts. The goal had been six plants and 1,000 megawatts. In the negotiations leading to the bilateral agreement covering this program, the only significant issues were over U.S. inspection rights and safeguards with respect to nuclear materials supplied by the United States. The U.S. negotiators wanted to send inspectors into nuclear facilities of European member states; the Euratom negotiators refused. A resulting compromise provided for

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[28] Donnelly, *op. cit.*, pp. 75–76.

Euratom to establish, for U.S.-supplied materials, a safeguard system meeting U.S. standards, developed with U.S. technical assistance, and indirectly monitored through frequent consultations and visits. Euratom also agreed to consult with the IAEA to assure that its safeguard and control system would be compatible with IAEAs.

The bilateral agreement further provided that if the IAEA should establish an international safeguard and control system, the United States and Euratom would explore its assumption of the safeguard function for all Euratom activities.

The U.S. relationship with Euratom has been a joint operational one, however cautious; that with the OECD Nuclear Energy Agency, despite U.S. membership in it, has followed more conventional lines of international cooperation and exchange. Dr. Donnelly comments on this apparent inconsistency as follows:

> Since both the NEA and Euratom were created to foster commercial use of nuclear energy in Europe, and since the membership of NEA represented until recently a larger potential market for the U.S. nuclear power industry than the six Euratom members, it seems curious that U.S. support to Euratom has so exceeded that for NEA. For the latter there are no joint undertakings with U.S. funding. One significant difference between the two multinational organizations may explain the difference in U.S. support. This, in the opinion of the writer, was the presence of the United Kingdom in NEA but not in Euratom. During the mid-1950s the U.S. nuclear industry was concerned that the United Kingdom with its strongly backed government program for development and application of nuclear power would be able to capture much of the world's nuclear power market. For the United States to have funded NEA projects may well have seemed to give a principal competitor in the international nuclear market still greater advantage. In these circumstances, U.S. support could not appear to benefit nuclear power research and development of interest to the United Kingdom.[29]

U.S. POSITION ON SAFEGUARDS

The U.S. relationship to the Non-Proliferation Treaty and the question of safeguards presents problems too complex and thorny to be identified briefly without distortion; the reader is referred to the more detailed treatment in pages 136–154 of the basic study. In general: the United States has consistently supported the principle of international safeguards administered by the IAEA; on signing the NPT on July 1, 1968, President Johnson offered to put commercial nuclear power in the United States under IAEA safeguards, even though the United States was exempt from them as a nuclear-weapons state. Presidents Nixon and Ford have reiterated this offer, but it has never been carried out. The United States has also consistently supported the work of the IAEA Safeguards Committee. One of the most important actions of the Committee—created in April 1970 to draft safeguards agreements between the IAEA and individual nonnuclear weapons states signatory to the NPT—was to specify the use of national systems of accounting and control for nuclear materials. Another important result of the Committee's work was to assure that the legitimate commercial interests of states subject to inspection would be protected. Most recently, the IAEA has begun to show leadership in drafting international guidelines for physical security of nuclear materials and facilities.

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[29] *Ibid.*, p. 114.

Role of Congress

Presidents Truman and Eisenhower established a pattern of close cooperation with the Congress in what was recognized as a matter of highest concern to U.S. security and other national concerns. There was active participation by the Congress in many of the developments attending the sharing of nuclear energy information and materials: numerous hearings were held, important legislation was passed, and advice and consent was given to treaty provisions.

To preserve nuclear secrecy as a national security measure, the Congress in the Atomic Energy Act of 1946 terminated nuclear collaboration with the wartime allies of the United States. As the Cold War intensified, the act was amended in 1951 to authorize the Atomic Energy Commission to enter into certain limited arrangements with allies, as in NATO, to give them nuclear information. The amendment was intended to strengthen military alliances, not to foster commercial uses of nuclear energy.

THE CONGRESS AND AGREEMENTS ON NONMILITARY USES

The Joint Committee on Atomic Energy held extensive hearings in May and June 1954 on revisions of the act proposed by President Eisenhower, calling for international cooperation in nonmilitary uses of nuclear energy. The resulting changes in basic atomic energy legislation greatly expanded U.S. encouragement of the commercial use of nuclear energy abroad. As before, international nuclear cooperation was to be effected through bilateral agreements with individual nations or with regional defense organizations. Not required to take the form of treaties, the agreements were to be negotiated by the AEC subject to congressional veto.

This legislative framework is the basis for U.S. cooperation with other nations in commercial nuclear energy matters; it made possible the IAEA, Euratom, the NEA, the network of bilateral and multilateral agreements negotiated by the United States, and the Nonproliferation Treaty.

The Joint Committee on Atomic Energy and the Senate Committee on Foreign Relations expressed a keen interest in the question of safeguards when the proposal to establish the IAEA was undergoing congressional examination in 1957. In favorably reporting the proposed Euratom Cooperation Act, the joint committee expressed its belief that a vigorous program of cooperation in nuclear power by the United States with foreign nations was desirable. The committee was more critical of the proposed bilateral agreement with Euratom and insisted on changes, particularly in connection with the safeguarding of nuclear materials furnished by the United States.

Mainly through the joint committee, Members of the Congress have closely followed proposals to sell U.S. technology for manufacturing enriched uranium. The committee has expressed concern over possible moves to provide this technology to foreign countries not only from the "giveaway" standpoint but also from that of effects on national security and U.S. obligations under the Nonproliferation Treaty.

On the whole, the Congress has shown awareness of both the dangers and the constructive potential of nuclear energy. However, it might have been appropriate—and still might be—for the Congress to demand more vigorous efforts on the part of the executive branch to resolve longstanding problems of control in view of their vital bearing on national and international security.

Outcome

The Atoms for Peace initiative seems certain to be judged among history's significant instances of the diplomatic response to a new science and technology. This initiative set forces in motion which have already changed the world. Propelled by some of those forces—the move to meet a growing shortfall in the world's oil supply through nuclear energy production; continued trends toward the proliferation of nuclear weapons and the potential for producing them—the future course of civil nuclear power is approaching a point of no return.

To epitomize all that Atoms for Peace set in motion is to oversimplify. Yet oversimplification may be necessary to highlight certain urgent realities and keep them from being obscured by a welter of detail. The two essential realities illuminated and acted upon by Atoms for Peace are (1) the growing potentialities of nuclear energy to help fill urgent world energy needs and, (2) the concomitant growing potential threat to the world's safety through the increase of national capabilities to make nuclear weapons, the potential risk of theft of nuclear materials by subnational groups, and possible insults to the global environment from escaped radiation. Constructive steps taken to meet the energy needs have not yet caught up with it but are on the way: the consensus in 1976 is that much of the world's electricity supply by the year 2000 can be provided by nuclear power if places can be found for nuclear power station sites and the fears of environmentalists can be allayed.

The outlook with respect to proliferation is more ominous. As Dr. Donnelly points out, European experience with international safeguards offers a working demonstration of inspection for future arms control and disarmament.[30] On the other hand, what many observers have characterized as the disappointing record of the May 1975 NPT Review Conference in Geneva reinforces doubts as to whether the momentum of progress toward an effective universal system of controls is equal to the overwhelming importance of the goal.[31]

Assessment

Some of the more pertinent observations of the 1972 study not already cited are listed below, with page number:

—Safeguards systems do not extend to physical protection against theft or diversion, but only to detection of it. Assuring the physical security of nuclear materials is a separate responsibility of the possessing nation. (p. 10)

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[30] *Ibid*, p. 155.

[31] See, for example: (1) The report of the President of the Conference, Swedish Under Secretary of State Inga Thorsson, as inserted by Senator Edward Kennedy in the *Congressional Record* for July 30, 1975, p. S14462: "What was a failure was not the conference, but the way in which the superpowers proved themselves unable to show the world not only their genuine will but also their capacity for disarmament. They did not make a contribution of strengthening the NPT regime." (2) Letter from Colgate University Professor of Peace Studies Alan Geyer to Senator Hubert H. Humphrey as inserted by the latter in the *Congressional Record* for June 3, 1975, p. S9353: ". . . it is painfully clear that the joint United States-Soviet line here [in Geneva, May 10, 1975] is to downgrade the conference and to stonewall any pressures to reverse their own mutual escalation of the nuclear arms race." (3) Arms control and disarmament specialist Thomas A. Halsted's "Report from Geneva" in *Arms Control Today*, June 1975, p. 1-3: ". . . the Conference underscored the fact that for the most part the Treaty has been an effective instrument for facilitating access to the peaceful uses of nuclear energy. Where the Treaty—and the Review Conference—continue to fall short remains in the harder questions of security. . . ."

—Despite the importance of a nuclear safety function for the IAEA, radiation safety guides are confused and apparently overlapping. In Europe there are standards issued by both the IAEA and Euratom. The United Nations has continued its Scientific Committee on the Effects of Atomic Radiation rather than transfer the committee's functions to the IAEA. Meanwhile, the latter's role in setting standards for the construction and operation of nuclear powerplants is dormant. (p. 64)

—Euratom's nuclear supply function has not grown as originally expected. The safeguards function, in contrast, has been performed effectively and has demonstrated the practicability of international inspection. (p. 86)

—The Safeguards Committee which the IAEA created in 1970 was open to all member states of the Agency, in recognition of the general interest in safeguards and the desire of nonweapons member nations to participate directly in developing safeguards agreements. The committee met intensively over many months and issued three reports covering all aspects of the proposed agreements. Nearly 50 delegations, very different in character, were involved. A British member of the IAEA Board of Governors who participated commented on the moderate, compromising spirit and friendly atmosphere which prevailed: "Informal consultation came to count for more and more in our work; and when we got back to the Board room even the intractable problems had been [more or less worked out]." (p. 142)

—Atoms for Peace has been unique as an example of international cooperation in scientific fields, in that international cooperation in the peaceful uses of nuclear energy came about as the result of deliberate decision of governments rather than of scientific communities. Among its other accomplishments, it has provided mechanisms for working on health, safety, and environmental problems which cross national boundaries. (pp. 26–27)

—Assuming that it is in the best interests of the United States and of world peace to see the Nonproliferation Treaty operate at full effectiveness, and granting that the bilateral agreements have provided the United States with certain benefits, it may be time to reexamine the respective roles of bilateral agreements and the IAEA with a view to possibly channeling more aid through the latter as a means of strengthening it. (p. 45)

—Although the IAEA evolved out of the discovery of fission by scientists, the scientific community had relatively little part in the negotiations. An eminent European nuclear scientist complained in 1960 that "Scientists do not generally know what an enormous effort lies behind the creation of a full-fledged international agency. They also do not know what an irresistible momentum lies in international organizations . . . it is practically impossible to terminate one [and it is] therefore only a question of the degree of usefulness of these indestructible giants which can be influenced . . . the scientists and technologists of the world . . . have not as a group realized the potential power of the instrument created, and have failed to follow up with . . . speaking or writing about the duty of scientists . . . we have not even tried to influence the selection of representatives of our countries for important positions in the Agency organs." (p. 49)

—If the IAEA had evolved in the direction indicated by the Atoms for Peace proposal, it could have had a major influence on development of commercial nuclear energy in Europe as a channel for technical assistance and nuclear materials. However, because of cold war tensions, the United States chose not to promote the Agency as a distributor, or custodian of a pool, of nuclear materials; neither did it support an international regulatory role for the Agency in the design and operation of nuclear powerplants. On the other hand, the Agency provided a forum in which United States and Soviet representatives could meet in a relatively friendly atmosphere at a time when most contacts between the two countries were strained and formal, if not hostile. (pp. 71–72)

—The experience of Euratom illustrated a diplomatic reality: the political cohesion of members of an international technological undertaking is a prerequisite to its success, not simply a desirable byproduct. As a corollary, the troubles of Euratom's R. & D. programs illustrate also how the cohesive force of internationalism in science may not be strong enough to withstand the divisive forces of national commercial interests. (p. 84)

—A tenet of modern management, private or public, is that an organization must plan ahead, particularly organizations that seek to create and apply new technologies. (p. 84)

—The Treaty of Rome is silent on the issue of environmental protection. Euratom has no statutory functions of ascertaining and controlling the environmental effects of nuclear power and fuel reprocessing plants. (p. 91)

—Euratom and the OECD's Nuclear Energy Agency overlap in many of their interests and activities. Euratom's usefulness appears to be handicapped by the dispersion of human and financial resources of its member states between its own programs and those of the NEA and IAEA. (p. 92)

—Moves toward European unity such as the establishment of Euratom have been eroded by a wave of nuclear nationalism. Euratom's successes have come in activities which were linked to the competitive status of the national nuclear industries of France, Italy, and West Germany. Inability to form a common European approach to nuclear technology has proved advantageous to the U.S. nuclear industry [but perhaps at the expense of long-range U.S. national goals and interests]. (p. 94)

—The lessons of the diplomatic effort of organizing joint U.S.-Euratom programs for nuclear power production could point the way toward future joint ventures to develop other new power sources, such as large-scale use of solar energy. (p. 108)

—From World War II to Sputnik, U.S. world technological leadership went unchallenged and was sustained in large part by advances in nuclear science and technology. Rather than seek to monopolize this leadership, the United States offered and supplied technological assistance to many countries, especially in Europe, to develop their own use of nuclear power. During the late 1960s, U.S. world leadership was challenged by other nations. Looking to the 1970s and to an era of greater peaceful rather than military competition, there are several fundamental

> issues involving nuclear energy: To what extent should U.S. foreign policy and diplomacy continue to foster commercial use of nuclear power abroad? Can such a policy help enough with future U.S. technological leadership to be worth the effort, or would the required financial and other resources be more profitably dedicated to some other venture? Would the benefits for U.S. technological leadership be more than offset by economic losses through competition from other countries receiving U.S. technological assistance? Most important of all, are there any significant risks and dangers from the standpoint of U.S. national security in continued U.S. support of foreign nuclear power development? (p. 156)

Diversity of outlook and experimental approach can lead to weakness or vulnerability when the danger is either unclear or not imminent. The potential for extreme danger in nuclear proliferation has been clear enough to American diplomatic and congressional leaders from the outset, but not the imminence of that danger. Reaction to this threat has been slow in coming.

Although many voices compete in the formulation of U.S. foreign policy, there is relatively free play for influential expression of the views of strong individuals (as Secretary of State or Secretary of Defense, for example) unchecked by sustained and sober analysis of the technological implications of any given proposal regarding nuclear energy. There is, in short, no central governmental machinery for technological assessment in the nuclear field comparable to the Office of Technology Assessment with its mandate in other areas. Furthermore, OTA is a mechanism of the Congress. There would appear to be a compelling need for centralized institutional machinery and procedures in the executive branch to provide impartial, measured, and long-range assessments of all nuclear energy developments or proposals (or needed initiatives) affecting U.S. national interests and international security.[32] It would follow that development of counterpart oversight machinery, possibly involving in part an extension of the OTA mandate, should be considered by the Congress.

Author's Reassessment in 1975

Author Warren H. Donnelly comments retrospectively as follows:

Beginning with the explosion of the atom bomb over Hiroshima in August 1945 U.S. diplomacy was doubly affected by the discovery of nuclear fission. The military use of atomic energy became a mainstay of U.S. foreign policy in dealing with the Soviet Union. By the mid-1950s the civil uses of nuclear power appeared promising enough for U.S. diplomacy to back efforts to promote the peaceful use of nuclear energy to create international and regional atomic organizations for this purpose. With the late 1960s and early 1970s the imperatives of nuclear weapons led to international treaties and agreements and to the strategic arms limitations talks. During these years, U.S. diplomacy also assisted the domestic development of nuclear power by helping to open markets for the infant U.S. nuclear industry and to provide opportunities to demonstrate nuclear power abroad before its introduction in the United States. On the whole, the discovery and use of atomic energy has afforded the United States new sources of leverage for its diplomacy, complicated the conduct of that diplomacy, and in many ways fundamentally changed relations between major world powers.

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[32] Dr. Donnelly comments (September 1975) that executive branch machinery for policy and management relating to civil uses of nuclear energy is now more fragmented than ever. One agency (the Nuclear Regulatory Commission) regulates the safety and environmental aspects of nuclear power use; another (the Energy Research and Development Administration) is developing new or improved technologies for nuclear power but is hesitant to promote them; a third (the Federal Energy Administration) is beginning to advocate nuclear power, but will expire on June 30, 1976.

RELEVANCE OF STUDY THEMES TODAY

The main themes of the study of this case appear to be as relevant near the end of 1975, or more so, than at the time of writing in the latter half of 1972. Recent events and factors influencing today's themes include:

—The oil embargo of 1973–74, which reawakened foreign interest in nuclear power, particularly in the United Kingdom, Europe, and Japan. Conventional wisdom (which a healthy skepticism may temper) now assumes that by the year 2000 as much as half of the electricity used by these countries will come from nuclear powerplants. Their development of strong nuclear industries will have implications for future U.S. diplomacy and foreign policy.

—The detonation of a nuclear explosive device by the Government of India on May 18, 1974, which provided a strong reminder that countries other than the leading industrial ones can, if they wish, acquire a capability to make nuclear weapons. Turkey recently has spoken of acquiring a nuclear weapons capability after its disagreements with the United States over Cyprus.

—The congressional concern expressed in 1974 over adequate safeguards as a result of proposed bilateral agreements between the United States and Israel and Egypt to help them acquire and use the technology for nuclear power production and over negotiations between West Germany and Brazil for the former to supply the latter with nuclear powerplants and a factory to recover plutonium from used fuels.

—The May 1975 NPT review conference in Geneva, which stimulated interest in many of the subjects covered in the study.

—Contemporary Presidential emphasis on international research to perfect or create new energy technologies. This line of activity, together with signs of increasing bilateral cooperation between the United States and the U.S.S.R. in energy research, will call for additional and new diplomatic efforts; these should benefit from U.S. experience to date with atomic energy.

With the benefit of 3 years of hindsight, Dr. Donnelly says, and taking into particular consideration events of 1974, if he were to rewrite this report he would give more attention to:

—The role of the International Atomic Energy Agency in international nuclear safeguards under the Non-Proliferation Treaty, and U.S. support of that role.

—The interaction between the IAEA and Euratom in the carrying out of nuclear safeguards, because of the anticipated importance of regional international organizations in the future.

—Extension of the concept of safeguards from simply detecting and announcing diversion or theft of nuclear materials to include the prevention of theft and recovery of stolen materials.

—The question of whether the influence gained by the United States' long standing but now diminished role as the principal free-world supplier of enriched uranium has justified the cost, and whether it is in the U.S. interest to expand the Nation's capacity to make enriched uranium sufficiently to maintain a free world monopoly position.

—The effectiveness of U.S. diplomatic efforts to persuade nulcear supplier countries to limit their exports of dangerous nuclear products and technology.

SOME LESSONS FROM THE STUDY OF COMMERCIAL NUCLEAR POWER

The subject of commercial nuclear power in Europe continues to be particularly illustrative of the interaction of science, technology, and diplomacy. This interaction is highlighted by such matters as the further favorable development of the gas centrifuge, the new prospects of laser enrichment of uranium, the possibility of transfrontier pollution from nuclear powerplants, demands that international nuclear safeguards be strengthened, and prospects for more vigorous international cooperation to develop the breeder reactor. Further proliferation of weapons-making ability, as well as attempts to halt such proliferation, will place great strains upon American diplomats and their diplomacy. Another complication is the congressional quest for a greater influence in the negotiation of international agreements for cooperation.

American experience suggests that international cooperation in energy production and similar high-technology enterprises should give less attention to technologies approaching commercial application and emphasize longer-term ventures in their early stages—as nuclear energy was until recently and as solar energy, fusion, or ocean heat research are now.

The author also states that he would now give much more attention to the impact of nuclear safeguards upon diplomacy, in anticipation of commercial use of the breeder reactor. The long-term future of nuclear power may depend upon success of the breeder reactor. If the breeder succeeds, it will greatly increase the amount of energy recoverable from world uranium and thorium resources. But it will also introduce great quantities of plutonium into international commerce; the control of that plutonium will pose many new problems for diplomacy. Indeed, some analysts view these problems as so unsolvable that they might favor barring use of the breeder both in the United States and elsewhere.

Legislative Implications

The study identified a number of issues for congressional consideration, most of which have legislative implications. Slightly updated, these include:

—Sustaining U.S. international leadership in nuclear technology in the 1970s.

—Reducing United States, European, and Japanese dependence upon imported oil.

—Controlling the possibilities for nuclear proliferation.

—Demonstrating the practicability of international inspection for arms control.

—Improving the U.S. position in world trade.

—Assessing the implications of domestic opposition to nuclear energy upon U.S. diplomacy.

—Maintaining a competitive position for the United States in the world market for nuclear goods and services.

—Cooperating in international efforts to control environmental effects of nuclear power.

—Developing international safety and environmental protection standards for nuclear powerplants.

—Protecting the U.S. position in uranium enrichment and fuel reprocessing.

Finally, the study identified two main lines of thought that the Congress might wish to pursue: the use of nuclear technology in U.S. diplomacy; and the use of diplomacy to advance nuclear technology. While separate, these lines do interact and that interaction should be systematically taken into account. The study also indicated a close interaction of U.S. domestic and foreign interests in commercial nuclear power, which suggests that if present efforts by Mr. Nader, the Union of Concerned Scientists, and others, to persuade the Congress to enact a moratorium on nuclear power reach the stage of legislation, the implications of such an act upon U.S. diplomacy would require analysis.

Further, the study sought to highlight present and coming issues of international safeguards for nuclear power. To strengthen international safeguards would necessitate treaty changes, with attendant Senate advice and consent; both Houses would be involved with legislation to authorize and fund new or expanded U.S. agency activities to this end.

Some Illustrative Questions

Cases One and Two suggest an extensive catalog of questions which appear to warrant congressional concern. Because of the special urgeny of the problems of nuclear energy utilization and control, they are given in some detail.

CHANNELING OF U.S. TECHNICAL ASSISTANCE IN NUCLEAR POWER

In the light of current concern over risks of theft of nuclear materials, should the United States seek renegotiation of the NPT to deemphasize this commitment and deliberately slow down technical assistance for nuclear power?

If U.S. technical assistance should continue, would U.S. interests be best served by channeling this assistance through bilateral agreements with recipient countries, by supplying it through the IAEA? Conversely, which approach would seem most favored by the recipient nations?

To what extent should U.S. technical assistance be limited to installation and operation of nuclear powerplants, with assistance for other parts of the nuclear power cycle to be avoided or withheld?

To what extent should the United States unilaterally proceed to reserve exports of nuclear materials, products, information, and assistance to those nonweapons nations that agree to place *all* of their nuclear materials and facilities under IAEA safeguards?

What should be the participation of the private U.S. nuclear industry in negotiating and carrying out bilateral arrangements—in particular, extension of present agreements on commercial use of nuclear power?

How satisfactory is the present interworking of the Energy Research and Development Agency (ERDA) and the State Department in negotiating and carrying out bilateral agreements? How consonant with national foreign policy have past bilateral agreements been?

What should be the U.S. position in offering technical aid and assistance to Arab nations for nuclear power?

To what extent should commercial exports of nuclear products, services, and technology by private organizations be required to conform to U.S. foreign policy, and how should this be done?

What should be the role of Congress in review and appraisal of major ventures in nuclear cooperation or in export of nuclear powerplants and associated goods and services?

THE INTERNATIONAL ATOMIC ENERGY AGENCY

What should be the U.S. diplomatic position on proposals to establish and enforce international standards for the design, construction, and operation of nuclear powerplants and other facilities of the nuclear fuel cycle that may present risks to the environment, to public health and safety, and to national and international security?

To what extent would channeling U.S. assistance exclusively through the IAEA strengthen that agency in general, and in its capabilities to provide effective safeguards for nuclear materials?

What should be the U.S. position on establishing and enforcing international regulations for transportation of fissionable and radioactive materials?

What should be the U.S. position on future development and use of nuclear-powered merchant ships?

What should be the U.S. position on extending international control of atomic energy to include location, design, construction, and operation of facilities that could cause transfrontier pollution in normal operations or in case of an accident?

What would be the implications of U.S. participation in such arrangements for domestic regulation of nuclear energy? What would be the expected roles of the State Department, ERDA, the Nuclear Regulatory Commission, and ADCA?

If the United States abandons its position as the sole supplier of enriched uranium to the free world nuclear powerplants, would U.S. self-interest be served better by establishing additional production facilities in the IAEA or by encouraging national or regional ventures?

To what extent would U.S. interests be served by having the IAEA locate, build and operate facilities to reprocess spent fuel, recover plutonium and depleted uranium, and store or manage long-term disposal of radioactive wastes?

Considering questions about safeguards being raised by domestic critics of nuclear power, what would be the comparative benefits and drawbacks of U.S. diplomatic efforts to revive the Baruch-Lilienthal plan in part and make the IAEA the sole proprietor of fuel reprocessing plants and all facilities for making plutonium into nuclear fuel elements for use in domestic nuclear powerplants?

The United States has offered voluntarily to place its domestic nuclear power industry under IAEA safeguards once hold-out nations have ratified the NPT. What would be the advantages and disadvantages of fulfilling that offer now without waiting longer for nations such as France, India, Israel, and mainland China to ratify?

What would be the pros and cons of a U.S. policy to promote consolidation of various regional nuclear organizations into the IAEA?

THE IAEA AS A "TESTBED"

To what extent is this idea inhibited in U.S. circles by the presence in the Agency of the Soviet Union and the People's Republic of China? Conversely, does the presence of these world powers in the IAEA make experiments with it a potentially valuable way to get new, practical working experience?

To what extent and in what ways could diplomacy isolate IAEA operations from ideological contests? Is this a realistic goal to postulate?

Has anything been learned from U.S. experience with the IAEA that applies to other fields such as aviation, transfrontier pollution control, communications, or disease control?

EURATOM

To what extent should the United States encourage Euratom to build and operate a uranium enrichment plant in Europe?

To what extent should the United States attempt to recoup some of the national investment in nuclear energy through licensing fees, royalties or other charges, or exports of nuclear products and technologies?

How long should the United States continue its commitment to supply nuclear power in Europe with enriched uranium? What would be the effects on U.S. foreign policy of a decision to end this commitment?

What participation should the United States seek in the setting of standards by Euratom governing nuclear power plants and related facilities? How much of such participation should be assigned to the Department of State and ERDA? How much should be left to voluntary efforts of the U.S. nuclear industry?

Should U.S. diplomacy seek to expand Euratom work in radioactive waste disposal and broaden U.S. participation in such work?

To what extent should U.S. diplomacy seek to influence the Euratom breeder program, particularly towards developments that could provide a fallback if the U.S. breeder demonstration program should fail?

How should available U.S. resources be divided among Euratom, the OECD Nuclear Energy Agency (NEA), and the IAEA?

What benefits would accrue from U.S. diplomatic efforts to expand Euratom's programs and laboratories from nuclear energy to fuels and energy in general?

JOINT EURATOM-U.S. RESEARCH

What did the United States learn from the Atomic Energy Commission's participation in the joint U.S.-Euratom research program? What were the strengths and weaknesses of the joint venture?

What are the implications of these lessons for other joint ventures (which the Secretary of State appears to be encouraging): for example, in fusion, solar energy, or synthetic fuels from coal?

To what extent should and could joint ventures with Euratom be revived for radioactive waste management and disposal, development and demonstration of nuclear safeguards technologies, and development of new and improved ways of finding and enriching uranium?

THE OECD NUCLEAR ENERGY AGENCY

Should U.S. diplomacy seek to combine Euratom with the NEA?

What conclusions can be drawn from the comparative success of NEA relative to Euratom?

U.S. NUCLEAR FUEL SERVICES

Should the United States seek to preserve its position as the sole supplier of enriched uranium to the free world? If so, what are the financial and other implications of such a commitment?

What would such a commitment imply as to demands on U.S. fuels to supply electricity for enrichment, and as to the environmental consequences of supplying such fuels?

If the United States is prepared to relinquish its monopoly position, what alternatives would best suit U.S. interests:

—Unilateral construction of enrichment facilities by many nations?
—Regional organization to build and operate enrichment facilities?
—International (IAEA) construction and operation?
—Encouragement to the Soviet Union to expand its enrichment services?

In retrospect, how useful and effective were U.S. efforts to hold back development of the centrifuge method of enrichment? To what extent are new enrichment technologies—for example, centrifuge, laser, nozzle, and other methods—likely to present a technological surprise and open the way to easy proliferation of foreign enrichment capabilities?

What diplomatic options are open to the United States should the Soviet Union seriously enter the world market for supply of enriched uranium and reprocessing of spent fuels?

THE NON-PROLIFERATION TREATY AND SAFEGUARDS

How close is the point of no return in the worldwide use of nuclear power beyond which it will not be possible to halt, slow down, or contain further growth?

What are the potential implications for U.S. diplomacy of:

—A substantial theft of nuclear materials?
—The successful use of stolen materials for purposes of terrorism, extortion, or foreign policy?

What, if any, preparations should the United States be making now to respond to the situations of question (2)?

What are the potential implications for U.S. diplomacy of:

—An accident in a nuclear facility at home or abroad that causes large offsite injury and contamination?

—State government moratoriums on future construction of nuclear powerplants?

Effective safeguards will require extraordinary measures to learn about, prevent, or intercept thefts of nuclear materials, or to recover stolen materials. What is the U.S. assessment of the need for a world protective or police force with perhaps supranational powers to give safeguards credibility? Are safeguards important enough to the United States to induce it to accept the problems and risks of such a force—especially if its members included nationals from the Soviet Union, its satellites, and mainland China?

To what extent should the United States in its bilateral and multilateral agreements extend safeguards terms and conditions beyond those compatible with the IAEAs functions under the NPT?

Within the United States what are the respective safeguards functions, responsibilities, and authorities of the Department of State, the Arms Control and Disarmament Agency, ERDA, the National Research Council (NRC), and the Departments of Defense and Commerce? Who is responsible for coordination of these Federal activities? How are these activities coordinated with U.S. foreign policy?

What level of international effort would be needed to assure reasonably effective safeguards in an international plutonium economy? How should this be financed? What should be the nature and extent of U.S. participation?

Should the IAEA be transformed into a world nuclear safeguards agency? Should the safeguards function be transferred to a new, separate agency with no other functions?

To what extent should U.S. diplomacy seek to expand international safeguards to include physical protection of nuclear materials, interception of attempts to steal materials, and recovery of stolen materials?

Many developing countries appear to be less concerned with safeguards than with acquiring the benefits of nuclear power. How are they to be persuaded that the need for safeguards is not a "put-on" designed to serve the convenience of the nations which already have nuclear power?

To what extent should the United States seek to influence preparation of the IAEA guidelines for physical security, and to adopt those guidelines for domestic U.S. safeguards?

To what extent and in what ways should U.S. diplomatic efforts encourage the planning, organization, construction, and operation of international, including regional, facilities for reprocessing spent nuclear fuels and related operations of fuel fabrication and perhaps enrichment?

To what extent would placing U.S. nuclear fuel facilities for civil nuclear power under IAEA safeguards by voluntary action reduce or neutralize expressed fears and concerns of nonweapons nations that IAEA safeguards may violate their sovereignty?

CASE THREE—THE POLITICAL LEGACY OF THE INTERNATIONAL GEOPHYSICAL YEAR[38]

Statement of the Case

The International Geophysical Year or IGY (July 1, 1957–December 31, 1958) was the most ambitious venture in international scientific cooperation in history. Broadly speaking, it had as its purpose the observation of phenomena relating to the entire Earth and everything in and around it. It enlisted the services of tens of thousands of scientists and volunteer observers from 67 nations, working at some 8,000 observation stations around the world. It yielded much scientific data, was attended by significant technological achievements, and stimulated other major international cooperative efforts involving science and technology in the years to follow.

Importance of the Case

The IGY's feats of science and technology were impressive and in some instances spectacular; its accomplishments in the area of politics and diplomacy were also important.

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[38] U.S. Congress, House, Committee on Foreign Affairs, *The Political Legacy of the International Geophysical Year*, a study in the series on Science, Technolcgy, and American Diplomacy prepared for the Subcommittee on National Security Policy and Scientific Developments by Harold Bullis, Science Policy Research Division, Congressional Research Service, Library of Congress, Washington, U.S. Government Printing Office, November 1973, 64 pages. (Committee print.)

Among the latter: (1) the IGY, while generously supported by national governments, was successfully run by scientists—for scientific and not for political purposes; (2) it nevertheless contributed to the diplomatic framework for later negotiations leading to such developments as the 1961 Antarctic Treaty, the 1963 Test Ban Treaty, and the 1967 Space Treaty; and (3) at least one IGY event did have a powerful political impact, especially in the United States: The Soviet launching of Sputnik I.

The IGY's scientific achievements included the acquisition and publication of valuable data relating, among other things, to cosmic rays, geomagnetism, ionospheric physics, meteorology, oceanography, solar activity, and the upper atomosphere. The Antarctic was opened up to scientific exploration on a substantial scale.

The outstanding technological development of the IGY—a development which has been widely characterized as marking the world's entrance into the Space Age—was the launching of artificial Earth satellites. Beyond making possible such important IGY scientific achievements as discovery of the Van Allen radiation belts, the use of satellites for scientific space probes opened "a new era of exploration and discovery which has progressed much more rapidly than could possibly have been foreseen during the IGY."[34] Progress has been so rapid and so extensive, indeed, as to raise the question of whether a second International Geophysical Year might be appropriate fo 1982–83.

How the Case Developed[35]

A certain amount of intercountry and interregional scientifi cooperation has long taken place in such activities as navigation an mapmaking. Not until the 18th century, however, did coordinate efforts by many observers at different locations begin to becom common. These efforts were intensified during the 19th century; fo example, an international conference was held at Brussels in 1853 t facilitate coordinated weather observations at sea. Increased coopera tion led to the formation of international scientific organizations i various fields, and then to the First International Polar Year (FPY of 1882–83.

During the FPY, scientists from 20 nations conducted studies i the high northern latitudes, with emphasis on surface meteorolog geomagnetism, and the aurora borealis. The success of their efforts le to the much larger undertaking, 50 years later, of the Second Inte national Polar Year or SPY (1932–33). Scientists from 40 countrie participated in the SPY; they concentrated on the same subjec that had occupied the FPY plus Earth-Sun relationships and atmo pheric electricity. An important result of the SPY was increase knowledge of the ionosphere, which facilitated the development radio communications.

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[34] Bullis, *The Political Legacy of the International Geophysical Year*, p. 31.

[35] For a more detailed account of the origins and development of the IGY, see: U.S. Congress, Sena *International Cooperation and Organization for Outer Space*, staff report prepared by Mrs. Eilene Gallow Legislative Reference Service specialist and special consultant to the committee, for the Committee Aeronautical and Space Sciences. Senate Document No. 56. Washington, U.S. Government Printing Offi August 12, 1965: 353–373.

IGY CONCEPT REPLACES THAT OF TPY

The success of the First and Second Polar Years, at intervals of 50 years, led to expectations that a Third International Polar Year (TPY) would be held in 1982–83. However, before even half of another 50-year period could elapse, it became apparent to some observers that the accelerating pace of technology and the fact that available basic data in the Earth sciences had been largely exploited were making further international observation efforts desirable. Early in 1950 Lloyd V. Berkner[36] proposed that the TPY be held in 1957–58, 25 years after the SPY, and coincidentally a period for which unusual solar activity was predicted.

The idea was widely discussed among scientists and scientific organizations, and in May 1952 the International Council of Scientific Unions (ICSU) established a special committee to take charge of planning for a Third Polar Year. Invitations to participate were sent to ICSU member nations and to the U.S.S.R. The response was only moderate, however, and included the suggestion from several scientific groups that the scope should be broadened to encompass worldwide phenomena rather than concentrating on the polar regions. ICSU considered the suggestion, and in October 1952 its general assembly approved the enlarged scope, which was reflected in a change of name from Third Polar Year to International Geophysical Year.

The IGY concept gained quick acceptance throughout the world scientific community. The ICSU special committee was enlarged and designated as CSAGI (initials of the French version of Special Committee for the International Geophysical Year); the English scientist Dr. Sydney Chapman was named president and Berkner vice president. The number of countries represented at CSAGI meetings grew from 26 in 1953 to 67 in 1958.

Enthusiasm for the IGY idea was not limited to scientists, but was,

> . . . shared by the various governments concerned, by heads of state, and by the public at large. This interest was aroused by the strong appeal of the IGY as a cooperative venture representing many nations working together for the benefit of all mankind. Consequently, the collective response of the many legislative bodies and governments whose approval was necessary to make the program a success was on a far more generous scale than that prompted by any previous scientific enterprise.
>
> Governmental support consisted not only of unprecedented financial contributions, but also of equally valuable and necessary logistic support. Governments cooperated by facilitating the movement of participating scientists from one country to another, and in assuring prompt movement through customs of scientific equipment on which the various programs depended.
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> . . . Widespread interest in the IGY was aroused in the general public by numerous articles in the daily press and in popular magazines. Consequently, more was undoubtedly known concerning the IGY than had been the case for any previous international scientific effort, and expectations were correspondingly raised.[37]

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[36] Author of the 1950 Berkner report on State Department organization and staffing for science and technology. For a description of the report and its consequences, see: U.S. Congress, House, Committee on International Relations, *Science and Technology in the Department of State: Bringing Technical Content Into Diplomatic Policy and Operations*, a study in the series on Science, Technology, and American Diplomacy, prepared for the Subcommittee on International Security and Scientific Affairs by Franklin P. Huddle, senior specialist in science and technology, Congressional Research Service, Library of Congress, Washington, U.S. Government Printing Office, June 1975, 180 pages (committee print) pp. 18–23.

[37] Bullis, *The Political Legacy of the International Geophysical Year*, p. 9.

IGY programs were selected mainly to assist in solving specific planetary problems of the Earth, with emphasis on problems requiring concurrent observations at many points around the globe and cooperative efforts by many nations. These problems fell generally into three broad areas: the Earth as a structure, atmospheric and oceanic circulation, and upper atmosphere physics and solar-terrestrial relationships. The broad areas were divided into thirteen scientific areas—for example: oceanography, ionospheric physics, nuclear radiation—in which research would be concentrated.

SCIENTIFIC RESULTS OF IGY

The scientific results were unprecedented:

> Tremendous masses of data were obtained during the IGY. For example, 17 tons of records were generated by American Antarctic stations alone. This dramatic outpouring of information posed more questions than were answered. Berkner likened the situation to that of coming from outer space and finding a new planet.[38]

One commentator wrote that cosmic ray physics had emerged from the IGY as "the broadest ranging of all man's intellectual endeavors," encompassing not only the vast concepts of galaxies and intergalactic space but also the microcosm of atomic particles and forces.[39] IGY investigations in the Antarctic showed that ice depths may extend to more than 14,000 feet. Much was learned concerning the elasticity of the Earth and its crust, and concerning the distribution of the Earth's mass. Additional valuable information affecting radio communications was acquired. Meteorological findings provided the basis for better weather predictions and for long-range efforts to exercise some degree of control over weather.

Experiments involving the explosion of small nuclear devices between the Van Allen radiation belts represented the first time in history that worldwide measurements of a completely controlled geophysical phenomenon had been made simultaneously. Studies of ocean currents showed that ocean depths are very much in motion, and not stagnant; one related finding was that deep ocean trenches are unsuitable for the dumping of radioactive wastes, another that life—including fish and crustaceans—exists even in the ocean trenches of the Pacific at depths of almost 40,000 feet. Studies of solar activity raised the possibility that much thermal energy might be transferred to the Earth's atmosphere through direct contact with the hot gases of the Sun's corona. Further, IGY research established that there is no definite end to the Earth's atmosphere—

> As far distant as 10 Earth diameters a substantial hydrogen atmosphere was found to exist, fading into the atmosphere of outer space itself, dominated by the effects of untold meteors, X-rays, ultraviolet light, protons, electrons, cosmic rays, and electric and magnetic fields. Thus, the upper atmosphere was found to be a place of considerable activity, affecting many phenomena on the Earth itself. Of tremendous interest was the discovery of the two Van Allen radiation belts, existing as annular shrouds about the Earth, shaped by terrestrial magnetic fields. These belts of intense radiation were seen as important factors in determining and perhaps limiting man's future exploration of space.[40]

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[38] *Ibid*, p. 28.
[39] *Ibid*, p. 28.
[40] *Ibid*, p. 31.

U.S. Involvement

The connection of the U.S. Government with the IGY, like that of other national governments, was unofficial. Nevertheless, about a third of the initial U.S. financial support—more than $43 million—consisted of appropriated funds. An equivalent amount was contributed by private institutions—mainly universities—with the remaining third provided through existing programs in both public and private research laboratories. Of the $43 million of appropriated money, nearly $20 million was for the U.S. Earth Satellite program.[41] Ultimately, logistical and operational support for IGY activities brought the total cost of the U.S. contribution to about $500 million.

Many different approaches to the administration of funds for the IGY were taken by the 67 participating countries. In the United States, a National Committee for the IGY—the USNC—was established by the National Academy of Sciences, a member of ICSU. The USNC served as a focus for all U.S. technical panels, geographical committees, and special groups, as well as for a broad cross-section of American geophysicists. It provided technical guidance for the National Science Foundation, which was responsible for preparation of budget estimates and for obtaining congressional appropriations. Among the U.S. Government agencies which assisted the USNC were the Departments of State, Defense, and Commerce, the Atomic Energy Commission, and the Office of Defense Mobilization.

Role of Congress

The original budget for the IGY presented to Congress by Dr. Alan T. Waterman, Director of the National Science Foundation, was for $13 million. Dr. Waterman emphasized that this budget was not to be confused with the separate amount of about the same magnitude needed for the NSF's regular programs. Altogether a considerably greater amount was requested, and more than $43 million was approved.

With only minor qualifications, congressional reaction to the IGY was positive, both in the early stages and after the event. As author Harold Bullis comments:

> Although both Houses of Congress supported IGY requests enthusiastically, the House frequently reduced the amounts requested whereas the Senate usually voted for the full amounts. The final figures arrived at represented a compromise between the two bodies. Action in the House reflected a belief that the budget estimates arrived at by the scientists were necessarily rough and could be reduced without damage to the U.S. IGY program, whereas the scientists insisted that the budget estimates were conservative and that any reductions would indeed severely damage the program. Irritation was also expressed in the House that the scientists were making use of administration prestige to "sell" the IGY program, thereby relegating the Congress to a back seat in the endeavor. These difficulties were relatively minor, however, and for the most part the Congress granted the scientists what they requested.[42]

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[41] In the light of the magnitude of U.S. spending for space exploration in the years following the IGY, $20 million seems a modest enough investment. However, even that amount was not arrived at without dissension. The associate director of this study series, Warren R. Johnston, recalls attending meetings of the NSC Planning Board in 1956 at which Presidential advisers debated the question of how much—or how little—money it would take to assure a minimally successful Earth satellite experiment. With the shock of Sputnik I, the emphasis suddenly changed from minimal to maximal.

[42] Bullis, *op. cit.* p. 16.

Major elements in persuading Congress to provide the needed funds were the desirability of simultaneous observations and on carrying out measurements throughout the entire globe, the evident expense of doing so, and the assurance that the program was finite and of definitely limited duration. Later, when Dr. Berkner, speaking for the USNC and responding to a Soviet proposal to extend the IGY formula beyond the 18-month period earlier decided upon, raised the possibility of further development of IGY activities, the congressional reaction was mildly favorable. However, the position of the American scientists themselves—who had repeatedly emphasized to Congress that the IGY was to be a specific, time-limited undertaking—had by then become hardened so that support for the Soviet direct continuation proposal was impractical.

The separate question of the impact of the IGY—or Sputnik—*on* the Congress is discussed below.[43]

Outcome

Some of the scientific results of the IGY have already been touched on. The main concern of this study is with its domestic political impact and its effect on U.S. diplomacy. These impacts were many and substantial. As quoted in the basic study, Walt W. Rostow sums up American reaction to the most spectacular of the IGY events:

> There is no clear analogy in American history to the crisis triggered by the launching of the Soviet Earth satellite on October 4, 1957. This intrinsically harmless act of science and engineering was also, of course, both a demonstration of foreseeable Soviet capability to launch an ICBM and a powerful act of psychological warfare. It immediately set in motion forces in American political life which radically reversed the Nation's ruling conception of its military problem, of the appropriate level of the budget, and of the role of science in its affairs. The reaction reached even deeper, opening a fundamental reconsideration not only of the organization of the Department of Defense but also of the values and content of the American educational system and of the balance of values and objectives in contemporary American society as a whole.[44]

The effect of Sputnik I in particular and the IGY in general on Government support for basic science in the United States was unprecedented. Federal funds were restored for scientific facilities previously closed down; the Federal Government's in-house research efforts were increased; Federal scientists and engineers received ingrade promotions and other preferential treatment. The budget of the National Science Foundation shot up from its pre-IGY ceiling of $15 million to about $159 million in 1960 and $416 million in 1965; by 1975 it had reached approximately $690 million.

THE SPACE PROGRAM

The most dramatic development sparked by Sputnik I—and probably the most significant, at least in the short run—was the "Space Race":

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[43] For a compact summary of the "vigorous and sustained role [of the Congress] in the adoption and implementation of U.S. policy for international space cooperation," see also the account by Mrs. Eilene Galloway, CRS Senior Specialist in International Relations, of "Congress and International Space Cooperation" in Senate Document No. 92-57 (*International Cooperation in Outer Space: A Symposium*), prepared for the Committee on Aeronautical and Space Sciences, United States Senate. Washington, U.S. Govt. Print. Off., 1971: 3-12. (Mrs. Galloway was appointed by Senator Lyndon B. Johnson in March 1958 to serve as Special Consultant to the Senate Special Committee on Space and Astronautics, and later to the Senate Committee on Aeronautical and Space Sciences.)

[44] Bullis, *op. cit.*, p. 38.

> The Soviet achievement carried the implication that the Soviet Union had mastered the primary technology required for an intercontinental ballistic missile. At one stroke, this achievement erased the issue of the "Bomber Gap," created a "Missile Gap," rendered obsolete the elaborate early warning system of the United States against bomber attack, reduced the warning time of an attack from hours to minutes, and raised the issue as to whether manned strategic bombers would not soon be obsolete. It gave a practical demonstration of the possibility and advantages of technological surprise. And, finally, it raised the prestige of the Soviet Union as a technological power of the foremost rank.
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> The U.S. response was enactment of Public Law 85–568, the National Aeronautics and Space Act, approved July 29, 1958. From this point on, the American space program was launched on an arduous and costly technological course for more than a decade of competition with the Soviet Union; it was to embrace a tremendous range of scientific investigations, technological concepts, and practical applications. Most importantly, for the purposes of this study, it was a form of activity of inherent importance in international relations: its achievements were prestigious and enabled the United States to recover and even raise its diplomatic stature; its operations were obviously global in nature and required the cooperation of many nations; and the exploitation of its technological capabilities offered attractive rewards to many nations, developed and undeveloped alike.
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> While space was later to be formally abjured as a military combat regime, satellites obviously offered great advantages for surveillance (which would contribute to the stability of the mutual deterrence evolving between the United States and the Soviet Union). Surveillance from space also offered a way out of the awkward impasse presented by Soviet reluctance to admit any form of external inspection as an adjunct of arms control agreements.[45]

The new space program made heavy demands on the Federal budget and caused some reshaping of both executive and legislative branch machinery. In addition to the establishment of NASA, there were radical changes in the Federal structure for national and international science policy and programs, including the appointment of a Science Adviser to the President and the location of the President's Science Advisory Committee directly within the White House—a step which, according to Berkner, had profound implications for making the needs of science, scientific research, and science education discussed and understood at top governmental levels.[46] The expanded science advisory apparatus within the Executive Office led in turn to creation of the post of Assistant Secretary for Science and Technology, or equivalent, in most old-line departments.

Within the State Department, which had created an Office of Science Adviser in 1950 and assigned science attachés to several West European countries but had curtailed these activities in 1955, the science function was revived. Science attachés were appointed to serve at U.S. Embassies in London, Paris, Rome, Bonn, Stockholm, Tokyo, Moscow, New Delhi, and some South American countries.

To promote military applications of space research, the position of Director of Research and Engineering was established within the Department of Defense, ranking above the Assistant Secretaries of Defense and possessing the authority to manage interservice projects without following the normal military chain of command. This senior officer was supported by an Office of the Director of Defense Research and Engineering and by the [Defense] Advanced Research Projects Agency.

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[45] Huddle, *The Evolution of International Technology*, p. 24.

[46] Bullis, *op. cit.*, p. 41.

CONGRESSIONAL RESPONSES

There were corresponding responses in Congress. A House Select Committee on Astronautics and Space Exploration was created on March 5, 1958, and replaced on July 21 of the same year by the Committee on Science and Astronautics (now styled the Committtee on Science and Technology). In the Senate a Special Committee on Space and Astronautics was created on February 6, 1958, and was superseded on January 14, 1959, by the Committee on Aeronautical and Space Sciences. Appropriations were passed funding NASA and the National Aeronautics and Space Council, which had also been established by passage of the National Aeronautics and Space Act of 1958.

OTHER DOMESTIC AND GENERAL EFFECTS OF IGY

Still other important effects are attributable to the IGY and Sputnik I:

—In the words of Walter Sullivan, a perceptive observer of the IGY as it progressed, they "precipitated an examination of the educational system and in fact, of the entire American scale of values."[47] Parents, school boards, and legislators became more aware of the importance of science training for the Nation's youth; curricula were revised, and mathematics and science courses which had been dropped reappeared; efforts were made to bring textbooks and teaching methods up to date: the National Defense Education Act of 1958 was passed, making substantial Federal appropriations available for these and related purposes.

—Sputnik I and its attendant publicity convinced Americans that they no longer possessed an undisputed lead over the rest of the world in science and technology. The universal concern which followed this jolt to American complacency helped focus public attitudes upon the necessity for basic research.

—An important outcome of the IGY earth satellite program was the development, under U.S. leadership, of international communications satellites. Less than two decades later, worldwide television broadcasts as events take place, from tennis matches and the Olympics to actual combat or meetings of heads of state, are taken for granted. The increasing interdependence of peoples around the world is accented by the growing network of facilities for instant TV, as well as radio, communications between distant points.

—Apart from their obvious advantages in arms inspections and military operations, satellites are proving to have many surveillance uses. A NASA study in 1967 listed these, among others: flood warnings; tracking of migrating birds, fish, and animals; iceberg reconnaissance; mapping of land areas and ocean bottoms; earthquake prediction; air pollution monitoring and forecasting; weather forecasting; and earth resources surveys (agricultural and mineral).[48]

—Good progress has been made in the use of satellites for weather forecasting. Of increasingly significant potential is their use for surveys of global resources of agricultural and mineral wealth and for the management of these resources.[49]

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[47] *Ibid*, p. 42.

[48] Huddle, *The Evolution of International Technology*, pp. 27-28.

INTERNATIONAL IMPACTS

The international impacts of the IGY and the Soviet Sputniks "were every bit as spectacular as were the impacts upon the United States and would be difficult to exaggerate."

> Foremost was the impact upon the cold war. Tensions heightened in East-West relations as the Soviet leadership sought to use its success in space to further its goals in foreign and military policy and as the United States countered Soviet thrusts with crash programs in space and missile development. Sputnik I catalyzed the cold war and not until the aftermath of the Cuban missile crisis 6 years later were Soviet-American leaders able to take the first steps decelerating the spiralling pressures of the arms race. Additional impacts were the effect upon the international politics of science, the use of science as a vital element in foreign affairs, and the generation of a remarkable degree of international cooperation and good will in politically nonsensitive pursuits.[50]

Noteworthy effects on international science included the strengthening of the ICSU and its affiliates; the bringing together of Western scientists with Soviets and others previously cut off from the Western world; the stimulation, on a worldwide basis, of the interdisciplinary approach to problem solving; and encouragement of the revival of science in underdeveloped countries newly experiencing their independence.

The IGY and the manner in which it was conducted served also, in various ways, as a model for other programs involving international collaboration in scientific activity. These new programs, governmentally sponsored, included the International Years of the Quiet Sun from January 1, 1964, through December 31, 1965; the Upper Mantle Program held in 1966–70; a Global Atmospheric Research Program; an International Geodynamics Project; an International Magnetosphere Survey; the World Weather Watch; Indian Ocean Research; and the International Biological Program.

Apart from organized developments and institutional impacts, the IGY was effective in helping to meld the top scientific talent of the various participating countries into an international scientific leadership element. The pervasive influence of this element has not been confined, over the years since the IGY, to purely scientific matters, but has moved into the realms of politics and ethics. The Pugwash Conferences are a manifestation of this trend; others include numerous conferences and movements of recent years in such areas as population control, food production and distribution, and conservation of the Earth's resources. While many other influences have combined to bring about these movements, the IGY appears to have played an important part in helping to set the stage for them.

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[49] Huddle, *The Evolution of International Technology*, pp. 28–29. (For further treatment of this latter subjec-see: (1) U.S. Congress. Senate. Earth Resources Satellites. Hearings before the Senate Committee on Aeronautical and Space Sciences pursuant to S. 2350 and S. 3484, August 6, 8, and 9 and Sept. 18, 1974. Washington, U.S. Govt. Print. Off., 1974, 336 p. (2) U.S. Congress. Senate. Earth Resources Survey System Hearings before the Subcommittee on Space Science and Applications, House Science and Astronautics Committee, pursuant to H.R. 14978 and H.R. 15781, Oct. 3, 4, and 9, 1974. Washington, U.S. Govt. Print. Off., 1974, 283 p.)

[50] Bullis, *op. cit.*, pp. 45–46.

Finally, there is highly suggestive evidence that the new communications channels, the tremendous cooperative spirit, and the increased understanding among participants of the 67 nations which took part in the IGY led directly to the Antarctic Treaty. Whether or not the IGY can be credited in such strong terms, it clearly played an important part in helping shape that treaty, which in turn reinforced the cooperative pattern for the other treaties and agreements which were to follow. Just as scientists approach their objectives through a step-by-step process, so did politicians appear to approach these international objectives in similar fashion, with similar success. [51]

Assessment

How can the full significance of an undertaking as far-reaching in its ramifications as the IGY be measured?

Perhaps, by way of caution—especially because, as Bullis notes, the record of the IGY as written by contemporary observers is full of exuberant praise but apparently lacking in significant critical reaction—the way to begin is with some negative considerations. He observes that it seems unfortunate in retrospect that the occasion of the IGY and its achievements was not systematically exploited in the United States to influence lasting public attitudes toward basic research:

> Unlike many of the activities of the IGY, which took place dramatically in remote and exciting areas of the globe, basic research was a difficult area of scientific activity for the general public to understand and appreciate, and still remains so. Although the IGY was, to scientists, primarily an exercise in basic research, to the public it appeared largely a matter of polar adventures and space satellites. Thus, were such an effort proposed today, it would appear doubtful that it would receive widespread public support unless the activities involved were sufficiently broadened so as to appeal to a wide variety of interests.[52]

Again in retrospect, the new emphasis in education on science and mathematics and on related curriculum, test, and teaching reforms was not entirely beneficial:

> Science careers may have been made attractive to some students who lacked either the necessary qualifications or the sustained motivation required for such careers. Furthermore, as Dean Harvey Brooks has pointed out, curriculum reform was largely undertaken for the wrong reason, namely, ". . . on the grounds that it was needed to make our engineers and scientists better than their Soviet counterparts," rather than because of a fundamental desire to improve the way in which science was being taught. Thus, while the Sputnik motivation increased interest in science and made changes easier, the danger also existed that both interest and programs might collapse once the motivation subsided.[53]

In the context of the issue of the nuclear threat, possibly more sustained and serious attention should have been given to the Soviet proposal for a continuation of the IGY organization and procedures. The spirit of cooperation engendered by the IGY itself, reaching not only scientists but also the world's peoples and their political leaders at a time when the prevailing atmosphere was one of cold war hostility, could perhaps have been captured and institutionalized in this way to bring lasting benefits of a still higher order of magnitude than those conferred by the IGY. Would the good will and flexibility implicit in such a response to the Soviet initiative have eased Soviet suspicions of U.S. intentions in other areas, such as arms buildup, and made for earlier and more certain solutions to pressing cold war problems? Or, on the other hand, would the Soviet Union have attempted to convert the extended IGY machinery into a front organization serving its own version of peace and progress? The answers to these questions are beyond the reach of the present study, but they would seem worthwhile for historians and long-range policy planners to ponder.

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[51] *Ibid.*, p. 62.
[52] *Ibid.*, p. 39.
[53] *Ibid.*, pp. 42–43.

In any case, it is clear that what the IGY and its sponsors failed to to do was far outweighed by its accomplishments. Its outstanding achievements in science have been mentioned. On the organizational level, a formula was invented which made possible the smooth and independent functioning of a complex enterprise, under the leadership of scientists, with generous support from many governments but a minimum of interference by them.[54] On the substantive side, although the IGY was primarily an exercise in pure science, it made brilliant use of contemporary technology; the scientific space probes which opened a new era of exploration were only the most visible of many such uses. In the area of international cooperation, to cite one category of results, the same technology employed in the Earth satellite program required agreements among nations which subsequently smoothed the way for other agreements in related areas.

There is, perhaps, a danger attending the euphoria generated by a great and successful enterprise in international cooperation like the IGY. Especially among scientists, for whom good will is an accustomed accompaniment to cooperation in scientific and technological problem solving, there may be a tendency to underestimate the problems inherent in the political setting. On this theme, Bullis comments:

> One of the difficulties in attempting to transfer scientific methodology into political reality is suggested by Sullivan's observation that "science, in treating our planet as indivisible, is far ahead of politics, which treats it as two worlds." In view of today's multiple ideologies, "multiple worlds" might be a more appropriate political designation. During the IGY, as a result of their common participation in efforts which opened up to man not only Antarctica but outer space, scientists were said to have experienced unusually strong feelings of humility and brotherhood. These feelings served to reinforce the traditional attitudes most natural scientists develop as a result of sharing with others the common objective of unveiling nature's secrets. There is but one universe for scientists to study, and its singularity unites all scientific minds.
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> . . . .
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> Thus scientists tend to have fewer social problems since their research is generally focused upon common, well-defined objectives offering "a natural point of convergence, namely, the correct result." Unlike politicians, they are not engaged in conflict resolution as a profession and are not charged with responsibility for the protection of national interests in a competitive arena. Rather, the existence of a common, agreed-upon technical objective creates a tendency toward social cooperation despite all obstacles, a tendency which has become a characteristic of the international scientific community. . . .
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> . . . .
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> In view of the substantial differences between the scientific and political communities in the kinds of problems they are respectively called upon to solve, prudence would suggest caution in looking for too bold a transfer of techniques from one community to another. The IGY itself was apolitical and closed ended whereas the political process is, *a priori*, political and open ended. Yet, politicians and scientists do share some important human characteristics. Politicians and governments, no less than scientists and scientific organizations, are capable of and motivated toward uniting to achieve common objectives. A major difficulty is that the procedures for finding solutions to problems facing politicians and governments are less clearly defined than are the procedures for finding solutions to the specific types of problems commonly faced by scientists and engineers. Scientific and engineering problems are typically more specifically defined than

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[54] See *ibid.*, pp. 9–13, for a description of how this was done.

> are political problems, which tend to be overburdened with value systems in which rational and irrational factors are intermixed.

Nevertheless, the author concludes,

> . . . if men can unite to solve problems under one set of circumstances (the scientific), there presumably is room for hope that they can learn to do so under another (the political). Scientists, as already indicated, tend to share this hope.[55]

Author's Reassessment in 1975

The International Geophysical Year was an episode, with a beginning and an end. The interval since the basic study was written has yielded no important new revelations about it or interpretations of its significance. Nevertheless, its influence continues to be exerted, as Bullis points out in the following observations of September 1975:

GLOBAL SCIENTIFIC COOPERATION

The IGY study represented a detailed examination of a specific example of how the world scientific community worked together in cooperation and good will toward resolving international problems. In particular, it analyzed the contributions this massive scientific undertaking made in overcoming ideological differences to bridge science and diplomacy. In so doing, the study attempted to identify and explain the attitudes, behavior patterns, and procedures followed during the IGY as a step toward détente.

These themes are as relevant today as when the study was written in 1973. However, international cooperation appears to have been a mixed affair. On the positive side, international exchange undoubtedly experienced sharp growth immediately following the IGY. Precise figures are not available, partly because of what is meant by an "international" meeting, partly because so many meetings have been held that it is difficult to keep track of them, and partly because interest in compiling relevant statistics does not appear to warrant the expense of collection. Such data as are available, however, indicate that the number of international meetings remained fairly constant throughout the early 1950s and through 1957, when the IGY began, and then increased by about 25 percent during 1958 and almost doubled during the next decade. (*Yearbook of International Organizations* data.) It would seem reasonable to infer that much of this growth resulted from activities initiated during the IGY.

IMPROVED TRANSFER OF KNOWLEDGE

Also on the positive side was the signing by the Soviets of the Universal Copyright Convention in May 1973. Prior to this time, the Soviets had reproduced about 70,000 pages annually from U.S. scientific journals published by the American Institute of Physics, and had been in frequent communication with the Institute regarding copyright permission and payment of royalties.[56]

It would appear to be a fair assumption that these scientific communications had a positive effect upon the Soviet decision to sign the Copyright Convention.

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[55] *Ibid.*, pp. 52-54.

[56] *Physics Today*, vol. 28, Jan. 1975, p. 119.

REMAINING OBSTACLES

On the negative side, the Soviets have not always honored tentative agreements for exchange of scientific information and research. Typical of this failure is lack of cooperation in mental health research, first proposed in mid-1971 and discussed in subsequent years as part of an overall health package, but still not agreed upon by 1974.[57]

Much of the delay has been due to Soviet unwillingness to discuss details of the proposed research and possible exchange of scientists between the two countries. More recently, U.S. scientists have developed doubts as to the advisability of such cooperation as a result of the possibility that some Soviet psychiatrists may be deliberately misdiagnosing political dissidents as schizophrenic to silence them by confinement in mental hospitals.

THE EMIGRATION PROBLEM

Another problem which has developed recently is friction between United States and Soviet scientists over alleged Soviet persecution of Soviet scientists who wish to emigrate to Israel. The head of the Foreign Relations Department of the Soviet Academy of Sciences has expressed the view that such emigration represents a capitalistic brain drain to the disadvantage of the Soviets,[58] whereas U.S. scientists have expressed their strong support for the Soviet scientists who wish to move. Correspondence between United States and Soviet scientists on this subject has at times been abrasive. As a result of these and other incidents, communication and travel by scientists between the United States and the Soviet Union have been characterized as recently as May 1974 as being "a difficult problem."[59]

A SUMMING UP

In summary, while it is clear that the "IGY spirit" is by no means in universal evidence throughout today's international scientific community, international scientific cooperation continues at a higher level of activity than it had reached in pre-IGY days. To the extent of the difference, there is perhaps justification for greater hope that bridges built by this cooperation will increasingly serve constructive purposes of science and diplomacy.

Some Illustrative Questions

The IGY yielded far more new data for scientists to assimilate than did the SPY 1932–33. On the other hand, data assimilation and technological application are growing progressively more rapid with every passing decade. The following questions are posed in the light of this latter consideration:

In what scientific areas covered by the IGY, and to what extent, is there already a need for fresh data? Are there other geophysical areas not covered by the IGY which should now be studied, from a purely scientific standpoint, through a similar international cooperative effort?

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[57] *Science*, vol. 183, Mar. 8, 1974, pp. 932–935.

[58] *Physics Today*, vol. 27, Aug. 1974, p. 64.

[59] *Ibid.*, vol. 27, May 1974, p. 78.

Besides the international conferences leading up to major treaties (Antarctic, Test Ban, and so on) and the governmentally sponsored scientific efforts like the IYQS, World Weather Watch, and International Biological Program—two categories of developments influenced by the IGY—the past two decades have witnessed a number of other major international and regional conferences in which science and technology have played important roles. These conferences, sponsored by governments to help solve tough political problems, have dealt with such matters as food (see Issue Three), population (also Issue Three), health (Issue Two), the exploitation of ocean resources (Case Five), and environmental programs (for citations see bibliography following this final chapter).

Have these, too, been influenced, in their organization and procedures, by the successful patterns established in the IGY? Has a conscious effort been made, in planning and conducting them, to build on the best experience of the IGY, other mainly scientific conferences, and the mainly political treaty conferences? Would a systematic, comparative study highlighting the goals, methods, procedures, and results of all these major conferences, beginning with the IGY, conducted by a university or a private research foundation, be likely to make a significant contribution in the interests both of scholarship and of improved governmental policy formulation and planning?

Much has happened to change the world in the short time since the IGY. Whether or not most of the scientific knowledge gained in 1957–58 has been assimilated, would it be useful to "stop the clock" and take fresh readings at IGY-plus-25, or 1982–83; i.e., hold a second IGY?

Should some new IGY follow the pattern of the first one in terms of scientific leadership with government support (but with minimal interference)? Would it be desirable this time for governments to take the initiative? Would this be feasible in today's world, with its increasing trend toward independent behavior by nationalist states and by regional or economic blocs pursuing special interests rather than global cooperation?

If governments take the initiative—or even if scientists retain it—would it be feasible and productive to focus a large part of the scientific effort on fields closely related to current human needs, the consciousness of which has come so much to the fore since the time of the IGY: e.g., energy, agriculture, exploitation of ocean resources, mineral discovery, and preservation of the natural environment?

CASE FOUR—THE MEKONG PROJECT: OPPORTUNITIES AND PROBLEMS OF REGIONALISM

Statement of the Case

On April 7, 1965, in a nationally broadcast and telecast speech at Johns Hopkins University, President Lyndon B. Johnson asserted U.S. willingness to negotiate an end to the then-expanding conflict in Vietnam, defended the U.S. policy of bombing North Vietnam, and offered U.S. support for an extensive program of regional development in Southeast Asia, including rehabilitation of Vietnam.

The President singled out for particular attention the Lower Mekong River Basin project, a major development enterprise undertaken in the 1950s jointly by Cambodia, Laos, Thailand, and Vietnam with the support of the United Nations Commission for Asia and the Far

East (ECAFE) and the cooperation of a large number of U.N. agencies, foundations, and individual countries.

As a peace initiative the President's offer failed; Hanoi and Peking emphatically rejected it. In retrospect it is seen as merely a brief episode of the eventful period, characterized by mounting opposition to the Vietnam War that culminated in the President's decision not to seek reelection in 1968. Nevertheless, it called attention to the potentialities of the Mekong project, both in itself and as a model, and of regionalism as an approach to development.

Importance of the Case

What emerges from this study as significant is not the President's proposal, dramatic though it was at the time, but the hardiness of the Mekong project and the regional approach:

> ". . . throughout the 7 years from the time of the speech to the present (May 1972), the international effort to apply technology to the systematic development of the Lower Mekong Basin has grown considerably. . . . Despite many strains, cooperation among the four countries of the Basin held steadfast. . . . As a multinational development effort it has demonstrated 14 years of continuity, stability, and growth." [60]

How the Case Developed

In a 1946 study of the United Nations Economic and Social Council (ECOSOC), Herman Finer wrote that—

> "The Council will encourage or institute regional conferences on economic, social, and humanitarian problems. . . . Some countries by reason of their proximity and certain common characteristics of geography and climate and location or the chance of history, have some problems in common.

Under its charter, ECOSOC on March 28, 1947, created an Economic Commission for Asia and the Far East (ECAFE), with headquarters in Bangkok, Thailand. ECAFE's scope extended to trade, agriculture, transportation, industrial and technological development, education, and data gathering. Its membership included all members of the United Nations in Asia plus Australia, New Zealand, France, the United Kingdom, the Netherlands, the United States, and the Soviet Union. (Other regional commissions have been established by ECOSOC: for Europe—ECE; Latin America—ECLA; and Africa—ECA.) [61]

In 1957 the four Riparian Nations (Cambodia, Laos, Thailand, and Vietnam), in association with ECAFE, established a permanent Committee for Coordination of Investigations of the Lower Mekong. The four members of the coordination committee representing the Riparian Nations had full powers of decision; an executive agent, heading a permanent advisory board of professional engineers created in 1958, had authority for making day-to-day decisions in preparing requests for technical and financial assistance, program planning and supervision, and staff support of the coordination committee.

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[60] U.S. Congress, House, Committee on Foreign Affairs, *The Mekong Project: Opportunities and Problems of Regionalism*, a study in the series on Science, Technology, and American Diplomacy, prepared for the Subcommittee on National Security Policy and Scientific Developments by Franklin P. Huddle, Science Policy Research Division, Congressional Research Service, Library of Congress. Washington, D.C., U.S. Government Printing Office, May 1972, 70 pages. (Committee print.) The quotation is from page 7. For a mention of how the Mekong project has survived the turbulent years since the above lines were written, see below under *Author's Reassessment in 1975*.

[61] Huddle, *The Mekong Project*, p. 16.

> On this rather unusual and extemporized foundation was erected the organization to plan and administer a regional program covering three-quarters of the drainage basin of the tenth largest river in the world, a region larger than France, with a population of perhaps 30 million.[62]

By the time of President Johnson's proposal for a billion-dollar aid program featuring the Mekong regional plan, a complex of 21 countries, 12 U.N. agencies, and 7 private institutions were contributing support to the project—donations and pledges were to reach $68 million by the end of 1965—and the technical and administrative resources of the coordination committee's executive agent and staff were expanding. France, India, and New Zealand were collaborating on preliminary plans for a major dam at Tonle Sap Lake in Cambodia; a Japanese team was at work on the Sambor Dam, also in Cambodia; the United States was taking the lead ($2.5 million in feasibility studies) in connection with a third great dam at Pa Mong in Thailand. Australia had a half-million-dollar program of geologic studies underway at both Sambor and Pa Mong Dam sites. In addition, construction was in progress on dams, channel markers, and other engineering or preparatory projects on tributary streams feeding the Mekong.[63]

In short, the enterprise to which the President proposed to extend massive support was no mere flight of fancy but a major project in being, backed by a strong and broadly based multinational commitment to see it through. At the same time, it could be considered a grossly underfinanced enterprise, proceeding at a pace which would require many years for completion of most of its elements and even decades for some. Was it not appropriate, then, for the nation which had fathered "the first regional development project to command worldwide attention—the Tennessee Valley Authority"[64] to offer assistance in accelerating the progress of this enterprise, as a constructive contribution to a negotiated peace?

The U.S. and world press in general found it appropriate, though recognizing the offer as part of a "carrot and stick" approach.

> The timing of the speech coincided with stepped-up bombing of strategic targets in North Vietnam by U.S. military aircraft, beginning with isolated strikes in mid-February, and broadening into a more sustained air offensive in early March. It followed by a week the President's decision, to be disclosed later on, to deploy U.S. troops and undertake ground combat operations in South Vietnam (to an extent that would number 184,314 military personnel in the area by the end of 1965).[65]

But Hanoi was not in a bargaining mood:

> The determined nationalism of North Vietnam in the face of conflict . . . remained obdurately aloof from the attractions of U.S. aid as an alternative to a prospective ultimate victory.[66]

U.S. Involvement

A succession of three studies was undertaken between 1951 and 1958 to explore the potential for a regional development program for the Lower Basin of the Mekong. The first of these was carried out by the Bureau of Flood Control and Water Resources Development of ECAFE. The second, made at the request of the Riparian States when the political situation in the area had stabilized briefly after the signing of the Geneva Accords of 1954, was a reconnaissance by the U.S. Bureau of Reclamation under the sponsorship of the U.S. International Cooperation Administration (later U.S. AID). According to the study,

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[62] *Ibid.*, p. 17.

[63] *Ibid.*, p. 26. (Table 1 of the study, pages 27–30, presents an impressive list of resources, including engineering and other technical services, contributed or pledged by the various countries, agencies, and institutions supporting the project as of January 1965.)

[64] *Ibid.*, pp. 1–2.

[65] *Ibid.*, p. 2.

[66] *Ibid.*, p. 66.

> Although the interest of the States themselves was undeniable, it seems likely that the initiative for this effort traces ultimately to France and the United States. It may well have been thought that stimulating a general interest in technological and economic development of the region might help to stabilize the political regimes there. At any event, a Special Project Agreement was signed between the Riparian States and the United States in November 1955. Thereafter, the representatives of the Bureau of Reclamation ranged the area, held several meetings with representatives of the four countries, and returned to the United States, where their "Reconnaissance Report—Lower Mekong River Basin" was issued in March 1956.[67]

This 36-page report and its detailed appendices received close attention in Indochina, the study continued, perhaps because it was issued by representatives of the nation that had most to offer in support of the project as well as the broadest experience with systematic river development. In any case it was a collection of the best data available about the region, and it specified what further data would be needed to get on with the project:

> Specifically, it called for hydrographic and sediment surveys of the main river; surveys of such features of the entire basin as topography, geology, transportation, communications, and agriculture; establishment of water flow measuring stations on the main stem and tributaries, weather stations, and a systematic search for preferred dam sites; studies of such special problems as the control of the water level of the great lake (Tonle Sap) in central Cambodia, the salty soil in the great Plaine des Jones of Vietnam, the technology of double-cropping to increase agriculture production, and improved fish capture and processing; and such action programs as improved sanitation in water supply, and the training of local personnel in the technical skills that would be required later on. The study emphasized the need for cooperation among the four Riparian States in collecting, maintaining, and disseminating data on a uniform, integrated basis.[68]

The Bureau of Reclamation report was enthusiastically endorsed when it was presented at the annual meeting of ECAFE in Bangkok in March 1957. Meetings of experts from the Riparian States were held in May and September to implement the recommendations of the report, and resulted in agreement on a charter for the aforementioned Coordination Committee.[69]

THE WHEELER AND FORD FOUNDATION REPORTS

When a Preparatory Committee met to adopt this Charter, it also asked the United Nations Technical Assistance Administration to help recruit a visiting team of water resources experts to review and amplify the previous studies. By mid-November 1957 a U.N. team had been assembled in Bangkok under the leadership of Lt. Gen. Raymond Wheeler (Ret.) of the U.S. Army Corps of Engineers. The Wheeler Report, completed January 23, 1958, reinforced and went beyond the recommendations of the Bureau of Reclamation study, proposing a 5-year program of data collection at a total estimated cost of $9,200,000.

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[67] *Ibid.*, p. 22.

[68] *Ibid.*

[69] Renamed in 1967 the "Mekong Development Committee."

In 1961 the Ford Foundation, at the request of the Coordination Committee, sent a mission headed by Gilbert F. White to examine the economic and social implications of the proposed development. The report of this mission was made in Bangkok in July 1962:

> It recommended substantial strengthening of the staff of the Coordination Committee in social science fields for the purpose of generating and collecting social statistics. It called for joint studies with intergovernmental agencies on problems of wide interest in the ECAFE region. It proposed that the Bank for International Reconstruction and Development (World Bank) be invited to participate in a study of methods for determining economic feasibility, and pointed out that the primitive economy of the Riparian States imposed inexorable limits on the rate of investment in regional development.[70]

The report emphasized the need for a systematic compilation of available data concerning resources, resource use, and social characteristics. It called for a power market survey, a land use inventory, and a study of ways to optimize agricultural use of water. The requirement for training of technicians was again emphasized. Further:

> The report suggested that flood control benefits might be overstated and the institution of a flood warning system could reduce losses at moderate cost. It suggested that a large demonstration area be set up where the potential impacts of the Mekong project upon rural life could be observed. It proposed an elaborate program of demonstration projects in forest planting. In the introduction to the report, the authors warned that heavy investment in engineering works would not automatically lead to solid growth in social structure and economic gains.[71]

Instead of "monolithic concrete structures whose most immediate return is inflation of the national ego," the report urged a more modest start and suggested that ". . . the first construction be initiated on one or more of the tributaries: They can provide essential experience with ways of reaping an adequate harvest of benefits from investment in water management." This recommendation, the study notes, directly conflicted with the views of the Coordination Committee, which had given priority to three very large engineering projects at Pa Mong, Tonle Sap, and Sambor.

The committee's views prevailed for a time over the Ford Foundation Report's concept of a small-scale beginning. On the other hand, the Foundation Report suggested a list of investigations and research projects which would require more extensive and close supervision than the Coordination Committee could manage. Nevertheless, the period of the Foundation study and the years immediately following was marked by an increased tempo of activity on the Mekong project. The number of participating countries increased, as did donations and pledges of contributions to support the planning studies, which rose from $20 million in March 1962 to $42 million by the end of 1963 and $68 million a year later.

THE MEKONG PROJECT'S BROAD BASE OF SUPPORT

Two things stand out in a review of the events associated with the Mekong project from its beginnings until the time of President Johnson's Johns Hopkins speech in April 1965. One is the broad base of support for the project, with no nation monopolizing the leadership; the other, the major contributions made by the United States, both officially and unofficially. A sampling of activities of the years 1962–64 will illustrate:

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[70] Huddle, *The Mekong Project*, p. 24.
[71] *Ibid.*, pp. 24–25.

> In 1964, a first geological map of the basin was completed. In France, work was proceeding on a mathematical model of the river while representatives from the Columbia River headquarters of the U.S. Corps of Engineers were undertaking a system study of the Mekong. Studies were underway by the World Health Organization of the problems of malaria and schistosomiasis in the basin. Scores of hydrologic and meteorologic stations had been set up and a radio network linked them to headquarters in Bangkok, where their reports were collected and tabulated. The Bureau of Reclamation was beginning work on a feasibility study of the Pa Mong Dam. Stream gradient measurements on the main stem had been completed in 1961 and measurement of the capacity of possible reservoirs was actively proceeding. In 1964, ECAFE completed an agricultural market analysis. Resources for the Future, Inc., had begun a study of world demand for products of electro-processing industries. A study of manpower needs and resources was begun in 1962, with the International Labor Office as lead agency. The Food and Agriculture Organization of the United Nations, and Israel, were studying agricultural improvement methods; plans were underway for farm and timber demonstration projects.[72]

With a broad base of support and stepped-up pace, the character of the investigations changed markedly as the project proceeded:

> Not only was the scope of the pertinent data recognized as far wider than it had been in the 1950s, but primary emphasis was shifting to the economic and social consequences of proposed constructions and development. In the United States, river basin development had followed this trend, but the conversion to total system planning had taken more than a century; benefiting from U.S. experience, the Mekong planning activity had achieved it in less than a decade.[73]

Role of Congress

Congressional reaction to the President's speech of April 7, 1965, was mixed. Senate Majority Leader Mike Mansfield saw the speech as a U.S. commitment to help make the peace, once obtained, "a dynamic peace, a peace of constructive benefit, not only to the people of Vietnam, North and South, but to Southeast Asia as a whole." Congressman Zablocki asserted that the "principal object" of the speech had been insufficiently recognized: "That is the bold move to stabilize Southeast Asia and assist the peaceful progress of the people in that area through a multi-national program of economic assistance, directed by the United Nations, in which Communist nations would be invited to participate." Senator McGovern declared that peace in Asia " . . . means precisely the kind of imaginative effort the President proposed . . ., including regional development . . . and experienced assistance from the best people available in the field of international development." Senator Moss added that the speech "represents a major breakthrough in international posture." On the other hand, Senate Minority Leader Everett Dirksen questioned the feasibility of an attempt to "buy peace with an American aid program," and Congressman Gerald R. Ford declared that . . . friendship, security, and solid international relationships cannot be bought with dollars." [74]

Despite forebodings, Congress supported the proposal advanced in the Johns Hopkins speech of April 7, 1965. When the President in a special message of June 1, 1965, asked for a supplemental $89 million in foreign aid funds for the Mekong River Basin project, Congress acted promptly to grant the request. On March 16, 1966, it authorized a $200 million subscription to the capital of the new Asian Development Bank.[75] Had the President's initiative succeeded in hastening an end to the war, there is little doubt that Congress would have given strong support to a postwar reconstruction program in Southeast Asia with the Mekong project as a major feature.

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[72] *Ibid.*, pp. 25–26.
[73] *Ibid.*, p. 26.
[74] *Ibid.*, pp. 4–5.

Outcome

President Johnson's initiative ended in failure. It seems clear that the main reason it failed was its timing: it was too late, probably by several years. The North Vietnamese were dug in and were apparently convinced that they held the long-run advantage. There is evidence, however, that the proposal was taken seriously at the time, even in North Vietnam, and that it had considerable influence on long-range thinking about regional development. Presidential emissary Eugene R. Black has commented as follows on the political impact of the speech in Southeast Asia:

> . . . there is little doubt in my mind that the political impact of President Johnson's offer of large-scale post-war assistance to South Asia was substantial. I say Southeast Asia rather than the "Riparian States" because the offer of assistance was not confined to them. I believe the President intended and I acted as though Southeast Asia covered the five Mekong countries—Thailand, Cambodia, Laos and both Vietnams—and Burma, Malaysia, Singapore, Indonesia, and the Philippines. And I considered the $1 billion offer to be more symbolic than mathematically precise. My visits and contacts included all of these countries except North Vietnam. Both an immediate and shortrange political impact of our offer was its positive role as a catalyst in stimulating the interest in and moves toward regional cooperation. While nationalism is, of course, the dominant political force in the region, this is now tempered by a fairly widely accepted view that the states of Southeast Asia have a common interest in working together for political, economic and even cultural reasons. Many of the regional organizations and groupings in Southeast Asia owe their origin or vitality to the boost for regional cooperation given by the United States in the period 1965–69. Best known is the formation in late 1965 of the Asian Development Bank.[76]

Less recognized but no less real, Black continued, was "the large increase in interregional personal contacts which occurred in Southeast Asia over these years at various levels and in various forums":

> I have in mind such developments as the initiation of plans for a regionwide study of transportation infrastructure (the study was completed in 1971 with help of the ADB); the coming together of ministers of education of the region to plan development of training institutions of regional significance and the mushrooming of specialized regional groups to consider one topic or another of economic, social or political significance. As for the Mekong "Riparian States," they have participated in most of this regionwide activity plus, of course, made progress in further developing plans for harnessing the resources from the river itself. The Johns Hopkins speech and the stepped-up interest in the development potential of the Mekong which it generated certainly had a healthy political impact in the non-Communist Riparian States by focusing attention on the future. I know this

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[75] Eugene R. Black, former—1949-62—president of the World Bank and in 1965 a special emissary of President Johnson in connection with the Mekong project, commented in his response of March 14, 1972, to some questions by the author of the Mekong project study that while the idea for the Asian Development Bank "had been around for several years and ECAFE circles favored it, its formation in 1965 resulted directly from President Johnson's April 7 general offer to Southeast Asia and his July offer to propose the United States join such a bank, if formed, which I was able to convey to a special meeting of Asian bankers in Bangkok." [See Appendix to *The Mekong Project*, p. 69.]

[76] Appendix to *The Mekong Project*, p. 69.

from my four trips to the area for President Johnson and subsequent visits. While I did not visit North Vietnam, I understand from C. L. Sulzberger's trip to Hanoi and other accounts that some political figures there were quite interested in the possibility of sharing in the proposed major development effort. At the same time it was as unrealistic in 1965 as it is today [March 1972] to believe that leaders in North Vietnam [bent] on conquest of the South would abandon their goals simply in response to offers of aid.[77]

Assessment

Study of the Mekong project as a particular undertaking, a model venture in regionalism, and as the subject of a major wartime political initiative affords a number of significant insights.

One is that "as a device to win over an adversary, the offer of cooperation in a regional development scheme does not present a convincing opportunity." [78] Or, to put it in more specific terms, "The response of the Hanoi authorities . . . appears to have demonstrated . . . that 'dollar diplomacy' does not convince an adversary as long as there is any reasonable prospect that he can outlast the United States without some form of capitulation." [79]

THE MOMENTUM OF NONPOLITICIZED REGIONALISM

Another is that a regional enterprise which is essentially apolitical and at the same time promises tangible economic benefits throughout the region may develop a momentum powerful enough to keep it going despite traditional animosities between groups within the region, and even under complex conditions of war. "Perhaps the most notable events to be chronicled about the Mekong scheme from its inception to early 1965, a period of more than a decade, were the events that did not happen":

> The rather improvised Coordination Committee was able to maintain coherence and control, as well as forward movement. The four Riparian States, despite several serious diplomatic contretemps, continued their active participation and cooperation in the committee. Communist factions in all four states did not impede the field studies or construction, and a minimum of guerrilla incidents were reported, even as the conflict in Vietnam worsened.[80]

Underpinning this phenomenon is a range of attractive characteristics shared by development enterprises which involve multinational regions and multilateral relationships:

> Emphasis is on local participation in development and planning;
>
> Subregions in greatest need and offering greatest opportunity for advancement tend to receive priority by local consent;
>
> Nationalistic preoccupations appear to be moderated;
>
> Self-help is encouraged and stimulated by being made more effective in combined actions with mutual support;
>
> National sensitivities that bilateral aid would exacerbate are less abraded by multinational arrangements;
>
> Regional cohesiveness—the tendency for people of different countries working together on a shared problem to lay aside their national differences—can result from attention to geographic regional goals rather than formal national boundaries;
>
> Burdens of foreign aid tend to be more widely distributed; and
>
> The process of applying technological means to social and economic objectives can be made coherent and understandable to those who expect to enjoy the benefits.[81]

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[77] *Ibid.*

[78] *The Mekong Project*, p. 66.

[79] *Ibid.*, p. 60.

[80] *Ibid.*, p. 30.

[81] *Ibid.*, p. 67.

GEOGRAPHY AS THE BINDING FORCE

But the binding force which may be the indispensable condition of the success of a regional enterprise is not man-made; it is the unity supplied by nature, a matter of geography:

> The ramifications of the Mekong project are beginning to appear almost limitless—encompassing river navigation and channel marking; flood warning and control; weather stations; hydroelectric power production-distribution-use; irrigation; mineral resource exploitation; primary manufacturing; fertilizer production and use; power market surveys; agricultural experiment and demonstration; public health, education, and training; bridges; roads; resettlement problems; and even archeological considerations. Were it not for the coherence inherent in the plan for a river basin in its entirety, the diffusion of effort would almost certainly be unmanageable.[92]

Regionalism—or more precisely, regional development—introduces the idea of a system within which technology is applied more coherently to a geographic unit than to a political unit. The technological system requires, first of all, an intensive application of science:

> The scientific base of a regional development scheme, of which the Mekong Lower Basin project is here the prototype, involves an enormous range of research disciplines: meteorology, soil chemistry, biomedicine, forestry, plant genetics, sociology, anthropology, marine biology, entomology, and geology, to mention only a few. The technology and engineering base of such a regional development scheme is similarly broad. It encompasses hydraulics, electric power, flood control, electronic communications, computer modeling, electrical industries, large demonstration farms, highway and bridge construction, fish and agricultural food processing, and many more fields of technological applications.[93]

ADVANTAGES OF MULTILATERAL REGIONALISM

One of the advantages of the multinational and multilateral regional approach is that it provides better guarantees than a unilateral or bilateral approach is likely to do that the social and environmental impacts of development will be fairly addressed and effectively dealt with. The long-range gains of this approach in assuring the purposefulness and benefits, in human and environmental terms, of a development enterprise, and also the stability of the enterprise, may greatly outweigh the short-term costs in inconvenience and (as the principal donor nations might see it) lack of control. Patience is required, among other things:

> What makes plausible the management of so large a program (as the Mekong project) with so miscellaneous an array of resources and authorities is that the project has shown an adaptive capability for 15 years, has not committed itself to an unmanageably large effort, has concentrated on laying a solid data base for each effort, and appears willing to accept a deliberate pace for the future.[94]

The question of adverse ecological consequences received little attention during the first decade of planning and development in the Lower Mekong Basin. Then rising anxieties in the United States over environmental consequences of applied technology spilled over into the Mekong project and compelled similar consideration of consequences for the inhabitants of the Mekong Basin. For example, the report of a field study of the Pa Mong Dam, financed by U.S. AID, predicted extensive disadvantages along with the benefits of the dam: bilharzia and malaria from the penned-up slack water, the negative consequences of heavy but seemingly necessary reliance on chemical pesticides, resettlement of hundreds of thousands of families from the reservoir area, need for large amounts of chemical fertilizer as farmers were displaced from fertile floor plains to less fertile uplands, flooding of prime timberlands, and diminished fish population. Nevertheless, as Claire Sterling put it in a series of newspaper articles on the Mekong project in 1971: "For once, developers and planners are giving some study to this sort of thing before the event." [85]

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[92] *Ibid.*, p. 54.
[93] *Ibid.*, p. 1.
[94] *Ibid.*, p. 17.

In general, observes the author of the present study, the policies of the Coordination Committee and its staff have appeared to be progressively more adaptive to both the sociological and the environmental impacts of the Mekong project. Mohamed Shoaib, a World Bank official, has summed up the adaptive process as one involving (a) deliberateness and incrementalism, (b) increasing pragmatism—learning by doing, and (c) attention to the problems created by intervening in depth in the subtle equilibria of established ecosystems. Shoaib observes that it can always be shown that the effects of any development will be in part adverse, but that the consequences of economic stagnation too are demonstrably adverse. He calls for a meaningful balance between the urgency of development and the demands for conservation . . . through a timely interdisciplinary approach to development planning.[86]

Author's Reassessment in 1975

Three and one-half years after the study was completed in the late spring of 1972, the author of *The Mekong Project: Opportunities and Problems of Regionalism* sees it in the following light:

THE MEKONG PROJECT IN PERSPECTIVE

The theme of this study is that a regional approach to development affords a focus for peaceful economic progress, serves as an educational process, and establishes a base for wider cooperation among participating nations. It offers a possibility for realignment of nations and international structures toward diplomatic goals: regional stability, international cooperation, tension reduction, a peaceful alternative to insurgency, and bridges across ideological and ethnic differences. The study does not assert that these are certain consequences of the regional approach, but suggests that the approach warrants further study as a possible way to improve the world system to exploit economic and technological resources in a more balanced and rational manner.

The Mekong project was a natural outcome of the application of U.N. values and purposes in Southeast Asia. The effort to expand it greatly as a means of damping a nationalistic and ideological conflict in Vietnam failed. However, the project itself showed remarkable durability, even under the stress of conflict and insurgency in the region. A possible lesson is that a constructive regional approach can help to evolve conditions and relationships favorable to international cooperation, but it is not a useful instrument for damping conflict already in progress.

With the withdrawal of the U.S. presence in Laos, Cambodia, and South Vietnam, a complete takeover of governmental authority by

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[85] *Ibid.*, p. 55.
[86] *Ibid.*, p. 56.

Communist-oriented groups followed. The most recent meeting of the representatives of the four Riparian States in the Coordinating Committee was in March 1975. A meeting scheduled for October, to be held in Vientiane, Laos, was postponed because of silence on the part of the Cambodian delegation; the other three were prepared to meet and apparently expect the work to continue. The executive director of the Coordinating Committee staff, W. J. van der Oord, was recently quoted in an interview in Bangkok as expecting the contributions for the next year's program from the Riparian States to be increased from $30 million to $50 million. U.S. participation is currently (December 1975) limited to contractor operations in Thailand. While there is uncertainty as to the future of the project, and as to whether it will maintain its previous practices of coordination and multilateral consultation, the remarkable fact is that the project is still alive with a chance to grow.[87]

The study traced the change in emphasis of the Mekong project from large civil works and capital-intensive development to socioeconomic programs appropriate to the local culture. Concurrently, an increased concern is evident for the environmental consequences—principally adverse consequences—of large public works. Taken together these two trends accentuate the human importance of technological impacts. An understanding of the cultures and economic systems of parts of a region undergoing development planning is now perceived as of foremost importance. The implication of these circumstances is that development under local leadership, with local participation, may yield slower and less substantial physical results but may tend to create institutions and social organization that are more stable and compatible with local culture and social forces. The study gave some, but perhaps not enough, attention to this requirement. Moreover, the role of regional development as a vehicle for cooperation, tension reduction, and social integration seems to be furthered by this shift of emphasis.

SOME OBSERVATIONS AND CONCLUSIONS

Among the conclusions and observations suggested by the study are these:

—Habits of cooperative relationship may be more important than formal organization in the mounting of a complex international development.

—A regional development program must harmonize differing national objectives rather than overriding them. In particular, a regional program cannot win acceptance if it aims explicitly to diminish nationalistic aspirations and contravene nationalistic values.

—The logical appeal of large civil works that enrich the energy, transportation, and resource development of a region, while reducing flood hazards, provides a powerful motivation for cooperative effort. It also justifies large capital investment. The risks of such large civil works are less obvious, but still real. There is a tendency for local leadership to concentrate on the gains and ignore the risks. However, unless gains are balanced against risks, the long-range consequences—both regional and diplomatic—may be unfavorable.

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[87] Source: U.S. Department of State.

—Political acceptability of a multination regional development project requires that benefits be evident to all participants, and that costs and benefits to each nation be in reasonable balance. A large multination project can attract contributions from many nations outside the region; these can aggregate to an impressive total investment even though no one contribution is much of a burden to the donor.

—An important benefit of a large project in a developing region is the necessary education and training of local participants, and the experience gained in local leadership and planning.

—The subject of regional application of technology for social purposes contains many of the elements that make the interaction of science and technology with diplomacy important politically. In addition to the potential contributions of the subject to diplomatic goals, it challenges the ability of the executive and legislative branches to exploit opportunities that may require years of evolution.

—When the President presents the Congress with a specific regional program, with the costs and benefits adequately defined, the Congress tends to respond favorably and promptly.

—The combining of U.S. interests in international regional development as an approach to national security and as an approach to economic advancement tends to detract from the effectiveness of such development for either purpose. A "low profile" of external supporting nations tends to yield most fruitful results.

—For a variety of reasons attention to international regional development by the Congress has diminished. Domestic economic concerns have attracted attention away from foreign development. Tensions in the Middle East have replaced Southeast Asian troubles as the focus of effort in conflict reduction. Confidence in the practical utility of social science for public policy has been shaken. Finally, there is a tendency for the Congress to give principal attention to short-term problems, at the expense of longer-range considerations—especially when the opportunities of diplomatic gain offered by the latter are at a low confidence level.

—To conclude with a quotation from the study itself: "It is sheer speculation that a U.S.-encouraged regional development of the Lower Mekong Basin in 1954 might have provided a focus for peaceful economic progress, served as an educational process, and established a base for wider cooperation in that disrupted region. However, the question seems legitimate as to whether the consequences of a slowly and deliberately encouraged regional development—region by region—in lagging parts of the world might serve U.S. foreign policy objectives in the long run." [88]

Some Illustrative Questions

What U.S. institution might best take the lead in planning for the application of regional development principles to advance U.S. diplomatic objectives?

Might the role of U.N. agencies be usefully expanded for this purpose?

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[88] *Ibid.*, p. 67.

Would the International Institute for Applied Systems Analysis (IIASA) in Vienna, Austria, be a possible locus for international planning of multination regional development?

What regions of the world offer the best opportunities for technical development, and which of these might yield the greatest diplomatic benefits—e.g., the Middle East, the Sahel, the Amazon Basin, the Iberian Peninsula, etc.?

In December 1973 Congressman Clement J. Zablocki spoke on the House floor in support of the formation of a Mideast Regional Development Bank. Such a Bank, Mr. Zablocki asserted, would "represent a positive, reasonable, and promising approach to promoting the social and economic development of the entire area, thereby creating a climate for true and lasting peace." [89] Is there still merit in this proposal as a practical possibility, considering present economic conditions in the Middle East and the world at large which reflect recent Arab oil price manipulations and revenue accumulations? Could it perhaps put some of the new oil wealth to work in ways beneficial to the entire Middle Eastern region?

What constructive roles might be played by multinational corporations in supporting multinational regional development projects?

What geographic features other than river basins might supply the central coherence for regional development?

Does the Tennessee Valley Authority offer any useful lessons, that is, in the relationships among States in the TVA area, on how best to exploit the diplomatic advantages of regional development?

Could TVA personnel serve usefully in educating local leadership in developing countries in the principles and methods of regional development?

What interactions would be valuable and should be provided between subnational and supranational regional institutions and activities? What kinds of clearinghouses are needed for the sharing of basic data in this field?

A stronger role is required of political and social scientists in the field of regional development; how is it to be defined and given scope?

How can political and social scientists best go about structuring an approach to defining the normative objectives of a region, as a framework within which economic objectives would be determined—and do so in a manner acceptable to the various political leadership elements involved?

Apart from economic factors, are there generalizations about regionalism—having to do, for instance, with social patterns reflecting adaptation to geographical environment—that need to be incorporated into the body of thought and planning doctrine on regionalism?

An invention is needed that can do for regional programs what the systems approach has done for missile and space systems development. The thrust of systems development is that all values must be quantitatively defined and subjected to cost-effectiveness analysis. What is the normative counterpart?

A critical factor to be dealt with in multination regional undertakings is the social tensions set up by bringing representatives of different cultures—however similar—together in working relationships. What standards and methods can be devised for measuring levels of intensity of these social tensions? How can changes in these levels (a) be brought about, and (b) measured? To what extent is it feasible to attempt to ascertain the ideal level of tension—that which would result in the best blend of harmony and accomplishment—for any given regional enterprise?

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[89] *Congressional Record*, December 11, 1973, H11076.

CASE FIVE: EXPLOITING THE RESOURCES OF THE SEABED[80]

Statement of the Case

The matter of who owns the ocean floor came into prominence as a consequence of technology. Historically, the seabed was an international commons of negligible utility. International law afforded no substantial provision for its governance or possession because there was no need for it. Man's invasion of the ocean deeps came gradually, beginning with exploration by deep-submergence vehicles, mapping expeditions using the military technology of ultrasonics, systematic collection of samples from the ocean floor, and ultimately core drilling of the seabed at progressively deeper submergences. Offshore drilling for oil by the United States, begun during World War II, led to the evolution of a large and complex technology that extended from its early application in the Gulf of Mexico to Asiatic waters, and most recently to the North Sea. Early discovery of manganese nodules, occurring in great profusion on the deep ocean floor, received little notice until world consumption of such materials as copper, nickel, cobalt, as well as manganese, contained in these nodules began to press on world capacity to extract them from sources on the continents. As the winning of these resources, as well as petroleum, from the seabed neared practicality, the question of who owns the ocean floor came to international attention.

Importance of the Case

Questions of national sovereignty traditionally rank high among the concerns of nations. Determination of seaward jurisdiction of coastal States remains an unresolved question with proponents of different interests adducing conflicting principles: major maritime powers seeking boundaries close in, some smaller states reaching out as far as possible, and some states pursuing a mixed strategy based on the principle of submarine geography.

The potential for conflict is inherent in a resource-rich region over which no authority of law extends. As on land, the riches of the seabed are unevenly distributed and the right of first capture can always be challenged by a stronger power. States lacking the technological means of exploiting the regime adopt the position that they should be able to share the harvest of seabed wealth from the international commons. Landlocked states contend that the accident of geography should not deprive them of a share in the new source of mineral wealth. Poor and less developed states base their claims for some preference in the matter on the fact of their relatively greater need.

The technology of extracting petroleum from the ocean floor is already being applied, with ever-increasing expertise. In the face of the energy crisis growing out of the OPEC oil embargo and price increases, seabed petroleum operations are growing in importance.

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[80] U.S. Congress, House, Committee on Foreign Affairs, *Exploiting the Resources of the Seabed*, in the series Science, Technology, and American Diplomacy, prepared for the Subcommittee on National Security Policy and Scientific Developments by George A. Doumani, Science Policy Research Division, Congressional Research Service, Library of Congress, 1971, 86 p.

As a practical matter, the resolution of the seabed issue in oil-rich areas is an early necessity.

Although the recovery of solid minerals from the deep ocean floor is less immediately in prospect, there is little question that the technology will eventually be perfected. The resources sought are enormous in their occurrence; indeed, it is estimated that they are accumulating by natural processes more rapidly than they could ever be mined. As a matter of quantitative perspective, it is reported that mankind will never be able to use as much magnesium metal as is contained in a single cubic mile of seawater. On the problem of resolving the rights of capture of these solid minerals, the diplomats of the world have some indeterminate period of advance warning before the issue requires operational solution. However, if the solution is not reached before it is needed, the prospect is that the technology of ocean mining will be put to use regardless, leading to many foreseeable (and doubtless some unforeseeable) international complications.

How the Case Developed

The study by George A. Doumani approaches the seabed case from two perspectives: the technological and the diplomatic. The focus of the case, however, is political. As the author notes, "It is conceded that development will be confined, for some time to come, to the Continental Shelf areas, and that progress into the deep sea is not imminent."

> However [Doumani continues], the confusion created by the Geneva Conventions, particularly the exploitability clause, invites review; definitive political boundaries are needed for the seaward limit of national jurisdictions. Beyond this limit, the deep sea areas would then be confirmed as the common domain of the community of nations. Whatever regime is suggested for this international deep sea domain is subject to legal considerations and international approval, but the issue is not as urgent as is the delineation of national jurisdictions at this time.[91]

After presenting in some detail the technological state of the art in exploiting seabed resources, the author recounts the political and diplomatic institutions that were endeavoring to deal with these "international legal considerations." A specific proposition was advanced, August 17, 1967, by the Permanent Mission of Malta to the United Nations that called, among other things, for the reservation of the seabed (outside of the limits of present national jurisdictions) from appropriation by nations, and the use of its resources primarily to promote the development of poor countries. In response, a U.N. ad hoc committee was formed to study the Malta proposal. Its report, in February 1968, was referred to a U.N. standing committee instructed to continue the work of developing a rationale for legal control of the seabed. As Doumani was completing his report, the U.N. Committee on the Peaceful Uses of the Sea-Bed and the Ocean Floor Beyond the Limits of National Jurisdiction—and especially its legal subcommittee—was engaged in an extensive series of studies in preparation for a "Law of the Sea Conference."

The first tangible result of the U.N. effort was the signing, February 12, 1971, of a "Treaty on the Prohibition of the Emplacement of Nuclear Weapons and Other Weapons of Mass Destruction on the Seabed and Ocean Floor and Subsoil Thereof." As the report went to press the treaty was awaiting approval by the U.S. Senate of its ratification. (The treaty was subsequently ratified.)

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[91] Doumani: *Exploiting the Resources of the Seabed*, p. 46.

U.S. Involvement in the Case

The Doumani analysis included a statement of the problem, a description of the U.S. and U.N. institutions created to deal with it, an account of problems up to July 1971, and an assessment of prospects for resolution of the problem thereafter.

Thus, in June 1966 the Marine Resources and Engineering Development Act, Public Law 89–454, was passed by the Congress. It established ". . . policies and objectives for the U.S. effort to develop the Nation's marine resources" and ". . . for the establishment of a National Council on Marine Resources and Engineering Development. . . ." that ". . . represented a wide-ranging mandate over the total national program in oceanography." [92] This Council was to make a comprehensive investigation and study of all aspects of marine science in order to recommend an overall plan for an adequate national oceanographic program that will meet the present and future national needs. One panel of the Marine Council was the Committee on International Policy in the Marine Environment. Another action by the Council was to recommend creation of an operating agency in the field. The policy committee lapsed in 1971, and was replaced by an Interagency Law-of-the-Sea Task Force, under the chairmanship of the Legal Adviser of the Department of State. The agency, as created by the Congress in October 1970, took the form of the National Oceanic and Atmospheric Administration (NOAA).[93]

A U.S. policy was proposed May 23, 1970, by President Nixon, who called for two types of "international machinery":

> First, I propose that coastal nations act as trustees for the international community in an international trusteeship zone consisting of the continental margins beyond a depth of 200 meters off their coasts. In return, each coastal State would receive a share of the international revenues from the zone in which it acts as trustee and could impose additional taxes if these were deemed desirable.
>
> As a second step, agreed international machinery would authorize and regulate exploration and use of seabed resources beyond the continental margins.[94]

As the study concluded, it was "too early to predict what success the U.S. proposal will achieve". It was likely to encounter opposition not only abroad but at home as well. Moreover, the proposal left untouched the thorny question of where the seabed began and the coastal shelf terminated. The U.S. position favored a 12-mile limit. Latin American nations clung to their 200-mile limits. Agreement would not come easy.

Role of Congress

Numerous committees and subcommittees of the Congress had interested themselves in the seabed problem.[95] An early congressional action was the creation of the Marine Council. Following the Malta proposal to the United Nations,

> About 3 dozen resolutions were introduced in the House and the Senate, mostly in opposition to vesting control over the deep ocean resources in the United Nations. House resolutions were for the most part identical, expressing

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[92] *Ibid.*, pp. 58-59.
[93] *Ibid.*, p. 60.
[94] *Ibid.*, p. 72.
[95] These are enumerated on p. 58 of the study.

> the sense of Congress that any action at that time to vest control of deep ocean resources in an international body was hasty and ill advised . . . .[96]

In hearings before several congressional committees, witnesses favoring the principle of the Malta Proposal cited as among its advantages the following:

> . . . regulation of the depletion of mineral resources, avoidance of an anarchic rush to claim and exploit subsea resources, reduced danger of marine pollution . . ., reduced threat of a military race to exploit strategic advantages of submarine weapons placement, provision of an independent income for the United Nations, and a general strengthening and maturity in the U.N. itself, through the experience of administering the vast area of the ocean floor.[97]

Objections to any U.N. action "stemmed primarily from fears that the United States might be giving away some valuable assets and rights the extent of which were not yet known". The qualifications of the United Nations to accept the responsibility were questioned. Scientific exploration might be hampered by a premature definition of political jurisdiction. National security interests might be compromised.

An executive branch proposal, August 3, 1970, became the focus of a series of hearings before the Senate Committee on Foreign Relations, Subcommittee on Ocean Space chaired by Senator Claiborne Pell. Hearings on the proposal were also held by the Senate Committee on Commerce, through its Special Study on United Nations Suboceanic Lands Policy, chaired by Senator Ernest F. Hollings, and before a Special Subcommittee on Outer Continental Shelf, chaired by Senator Lee Metcalf. These sought answers to such questions as:

—What were the limits of the Continental Shelf?

—Should the limit be geological or legal?

—Should it be based on considerations of equity, security, or economic advantage?

—How much did the United States stand to lose by the creation of an international regime?

—Was a new Law of the Sea Conference necessary?

—Should the States have a narrow or wide Continental Shelf?

—For areas beyond the Continental Shelf, what sort of an international regime would be best?

—What kind of international machinery should be established?

—How did all these aspects affect the economy and national security of the United States?

The hearings made evident that two differing sets of policies were taking shape, one favoring substantial transfer of jurisdiction beyond a narrow Continental Shelf to an international body and the other urging extension of the Continental Shelf to the limit of exploitability.

Outcome

The case was unresolved by the time the Doumani report went to press. In fact, it continues unresolved in early 1976, more than 4 years thereafter. As an interim measure, a policy was proposed by the United States to the United Nations that "all nations join the United States to insure that all permits for exploration and exploitation of the seabed beyond the 200-meter limit be issued subject to an international authority".[98]

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[96] *Ibid.*, p. 61.
[97] *Ibid.*, p. 62.
[98] *Ibid.*, p. 85.

Writing in 1971, Doumani concluded his study with the observation that evolution of U.S. seabed policy "had been relatively slow".

> Undoubtedly the marine scientists and technologists would have preferred a brisker pace than the diplomats were prepared to take. For its part, the Congress was ready to move faster than was the Department of State, although in what direction is still not evident.[89]

Assessment

The United States and the other interested countries of the world have long had the opportunity to resolve the question of who owns the seabed before the beginning of a rush of entrepreneurs to exploit the seabed mineral wealth, using technology certain to be perfected sooner or later. The problem is not a technological one, although it is created by technology and without the prospect of a technological opportunity the problem would be a trivial one. Only when the technology is perfected to enable profitable exploitation of seabed resources will the problem require urgent solution.

The advantage of advance resolution of the problem is evident. One can imagine the chaos of an international gold rush into a territory without law or property rights. The prospect of anarchy in a difficult and perilous environment, with many claimants and costly equipment, is disturbing to contemplate. For the United States to assert a policy of "right of capture," based on this country's technological superiority, affords no answer if the right should be challenged by another nation using officially sanctioned force based on territorial claims. Either the seas will be apportioned among national sovereignties, perhaps by force, or some device for shared sovereignty in the hands of a jointly established regulatory body must be created to regulate the international commons. One way or the other, an agreed decision must be made among nations as to jurisdiction over every part of the ocean floor. Sovereignty, like nature, abhors a vacuum.

In 1971 the U.S. Department of State had not formulated any clear policy on how to resolve the dilemma. The Congress was divided between a national and an international solution. There was uncertainty over the competence and even the political stability of the United Nations. The problem of extent of seaward boundaries remained unresolved. There were emerging differences in goals between the developed and the developing nations. And uncertainty over the timing of technological advance permitted the problem to linger in controversy until technology itself would eventually compel a crash solution under crisis conditions. It is interesting to note that in this case the essential facts of the situation are not in question; the case is political and diplomatic rather than technological, even though it is technology that makes it important.

Author's Reassessment in 1975

The study defined the legal and physical boundaries of the seabed and presented an inventory of its resources. The value of these resources was then related to economics and the present and future technological capabilities for exploring and exploiting them. The study discussed potential technological breakthroughs, particularly in the areas of offshore oil and hard minerals on the ocean floor.

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[89] *Ibid.*, p. 86.

Political aspects were also considered, with particular attention to the U.S. policymaking apparatus. From the national scene, the study moved into the international arena and concentrated on the concern of the whole world over ocean space. It also explored the effect of science and technology in shaping national and international policies, as well as the effects of man's activities on the environment.

Underlying these various discussions was a call for a new sense of world community and a new breed of scientist-diplomat to meet the pressing need for fair and proper conduct in the international diplomatic process.

These themes are as relevant today as they were when the study was written. The study stopped chronologically at the time when the world community of nations was preparing for the Conference on the Law of the Sea. Thus it served as a reference tool for those intending to participate in the Conference. The first session of the U.S Law of the Sea Conference was held in 1974 in Caracas, Venezuela, but no final agreement was reached.

If the study were to be altered, alteration would be in the form of updating the chronology of events rather than alteration in the scope of the study. However, since the problems of the seabed have not yet been resolved, any alteration to the study at this time would be premature. The subject remains relevant to congressional concerns, and both Houses have been active in related legislation since the publication of the study. As far as the project series is concerned, the study is much more relevant today than when it was written. This relevance is particularly evident in the executive branch, where the State Department, pursuant to statute, has created the Bureau of Oceans and International Environmental and Scientific Affairs, headed by an Assistant Secretary of State.

Throughout the text the study showed the interaction of science and technological development with the diplomatic process and with the process of decisionmaking on the national level toward exploring and exploiting tne seabed resources. The conclusions reached can be maintained with the same emphasis today.

Legislative action was initiated or completed in some areas directly related to the contents of the study, such as the bills introduced in the 92d and 93d Congresses for the exploitation of hard minerals on the ocean floor, the resolutions in both Houses regarding the Law of the Sea Conference, and the measure introduced in the Senate Foreign Relations Committee for the creation of the above-mentioned bureau in the Department of State.

The significance of the issues raised by this study has not been difficult to communicate to the Congress and the American people. The subject has been the focus of attention throughout the world since 1967, and recognition of its significance has been spreading into a wide spectrum of the academic, industrial, economic, and political sectors of the Nation. This significance is also reflected in governmental reorganization in both the legislative and executive branches, particularly in the former where several committees and subcommittees have established jurisdiction over ocean matters.[100] The Senate Commerce Committee also initiated the National Ocean Policy Study in 1974, aimed at focusing Federal attention on, and national recognition of, the issues of offshore resources.

In evaluating the study and its effects, it can summarily be said that the study was needed, was timely, and will remain a useful reference for the period ending with the Conference on the Law of the Sea. It has been useful to Congress in particular, and has had wide use by many different people, governments, and organizations.

POLICY PROPOSAL BY SECRETARY KISSINGER

Secretary of State Henry Kissinger in a speech given on August 11, 1975, before the American Bar Association annual convention advanced the following set of proposals for seabed policy:

—An international organization should be created to set rules for deep seabed mining.

—This international organization must preserve the rights of all countries and their citizens directly to exploit deep seabed resources.

—It should also insure fair adjudication of conflicting interests and security of investment.

—Countries and their enterprises mining deep seabed resources should pay an agreed portion of their revenues to the international organization, to be used for the benefit of developing countries.

—The management of the organization and its voting procedures must reflect and balance the interests of the participating states. The organization should not have the power to control prices or production rates.

—If these essential U.S. interests are guaranteed, we can agree that this organization will also have the right to conduct mining operations on behalf of the international community primarily for the benefit of developing countries.

—The new organization should serve as a vehicle for cooperation between the technologically advanced and the developing countries. The United States is prepared to explore ways of sharing deep seabed technology with other nations.

—A balanced commission of consumers, seabed producers, and land-based producers could monitor the possible adverse effects of deep seabed mining on the economies of those developing countries which are substantially dependent on the export of minerals also produced from the deep seabed.[101]

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[100] During the 92d Congress the determination to protect U.S. investment in deep seabed mining operations crystallized into legislative proposals. Legislation revised as a result of hearings held in 1972 and 1973 was introduced during the 93d Congress. S. 1134, as amended, and H.R. 12233—the Deep Seabed Hard Minerals Act—would require U.S. nationals to obtain a license from the Secretary of the Interior before engaging in the exploration and commercial recovery of manganese nodules on the deep seabed. S. 1134, as amended, was favorably reported to the Senate on August 21, 1974 and referred to the Senate Committee on Foreign Relations on September 4, 1974.

During the 94th Congress the Deep Seabed Hard Minerals Act as reported out of the Senate Interior and Insular Affairs Committee during the 93d Congress was reintroduced as H.R. 1270/S. 713.

[101] Henry A. Kissinger, "International Law, World Order, and Human Progress," speech before the American Bar Association Annual Convention, Montreal, Canada, August 11, 1975, pp. 4-5.

At this time the Secretary also took note of several other issues that must be faced when the Law of the Sea Conference reconvenes in New York in 1976:

> Ways must be found to encourage marine scientific research for the benefit of all mankind while safeguarding the legitimate interests of coastal states in their economic zones.
>
> Steps must be taken to protect the oceans from pollution. We must establish uniform international controls on pollution from ships and insist upon universal respect for environmental standards for Continental Shelf and deep seabed exploitation.
>
> Access to the sea for landlocked countries must be assured.
>
> There must be provisions for compulsory and impartial third-party settlement of disputes. The United States cannot accept unilateral interpretation of a treaty of such scope by individual States or by an international seabed organization.[103]

Some Illustrative Questions

What are the implications for U.S. policy on the 1976 Law of the Sea Conference of the apparent deterioration of the U.N. General Assembly into a majority of small states and a minority of large (and developed) states? Does the current controversy over the Palestine Liberation Organization presage a substantial withdrawal of U.S. support for the United Nations? Is the family of U.N.-affiliated agencies jeopardized by this growing impasse?

What is the likely timing of technological exploitation of seabed minerals today, and what are the implications of this timing for the urgency of reaching a resolution of the seabed problem in the 1976 conference?

What factors and trends in the world diplomatic situation have tended to obstruct the reaching of agreement on a Law of the Sea, and what other emerging diplomatic/technological problems might also be obstructed by these factors and trends? What constructive measures might be taken by the United States to reverse them?

Might U.S. technological capabilities provide a leverage to promote international agreement in the seabed problem?

Are there other U.S.-developed technologies having broad geographic implications that could provide leverage to promote agreement on a Law of the Sea?

Would a regional approach—one which took account of the needs of landlocked countries—be useful in working out a system of benefits from exploitation of seabed resources?

CASE SIX—U.S.-SOVIET COMMERCIAL RELATIONS: THE INTERPLAY OF ECONOMICS, TECHNOLOGY TRANSFER, AND DIPLOMACY[104]

Statement of the Case

"The establishment of the Joint U.S.-U.S.S.R. Commercial Commission at the May 1972 Summit Conference and the signing of a comprehensive set of trading agreements on October 18, 1972, opened a promising new period of economic relations between the two nations." (p. 1) It initiated what Secretary of State Kissinger called the process of creating a "vested interest in mutual restraint". Although the scope of the agreements is limited to economics, trade, and technology transfer, its political significance is judged by U.S. leaders to be high; costs and benefits of both the economic and political consequences need to be assessed. The Hardt-Holliday study sought to provide a preliminary assessment, and in particular to identify the imponderable questions that need to be monitored in the future as the process of building the relationship unfolds.

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[103] *Ibid.*, p. 5.

[104] U.S. Congress, House, Committee on Foreign Affairs, *U.S.-Soviet Commercial Relations: The Interplay of Economics, Technology Transfer, and Diplomacy*, in the series, Science, Technology, and American Diplomacy prepared for the Subcommittee on National Security Policy and Scientific Developments by John P. Hardt and George D. Holliday, Congressional Research Service, Library of Congress, 1973, 106 p. (Committee print.)

Throughout this commentary all citations are from this source. Page numbers are given in the text immediately after the citation.

Importance of the Case

Any bilateral undertaking or transaction involving the United States and the Soviet Union is of inherent importance to the extent that it reflects change in the relationship of the two superpowers. This relationship between two nations which are joint custodians of ultimate military power can determine the well-being of the rest of the world, as well as their own. Any agreement that promotes accommodation or reduces tension, that promotes peaceful dealings or reduces competition in military technology, has importance for world peace and security and accordingly for the security of the United States, which is the Nation's ultimate diplomatic goal. Trade, according to the hypothesis favoring the 1972 détente, influences internal policy as well as external dealings of nations; and, "in the long run, selected trade, intelligently negotiated and wisely administered, may turn out to have been one of our most powerful tools of national policy". (p. 7)

The importance for the United States of the series of 1972 trade agreements is only moderately in the field of economics. U.S. exports are limited by Soviet willingness to accept trade deficits, U.S. willingness to extend trade credits, and U.S. acceptance of Soviet exports. Totals allowed by these constraints on Soviet dollar earnings and credit are not impressive.

However, the policy implications of Soviet adjustment to the changed U.S.-Soviet trade relationship are seen to be of potentially high importance. They affect such factors as the military arms race, Soviet allocation of resources as between military weapons development and civil goods production, long-term trade commitments, and long-term commitments to technological development programs incompatible with a vigorous military posture.

It would seem beneficial to U.S. diplomatic goals that Soviet interest in improved economic relations with the United States should be expressed in terms of a reordering of Soviet priorities favoring "technological change and improvement in the availability of desirable consumer goods to the Soviet workers and peasants". (p. 75) It does not appear likely that the Soviets can pursue vigorously both the arms race and expanded productivity to sustain exports and pay for imports in connection with programs to modernize their economy and to increase the availability of consumer goods.

From the Soviet point of view, the trade pact might be expected to yield such selected benefits as: The closing of the technological gap in Soviet production of civilian goods (p. 15), expanded production of Soviet oil and gas based on U.S. technology (p. 16), increased production of nonferrous metals (p. 18), and improved quality of consumer goods (i.e., better diet, clothing, personal transportation, and housing) (p. 19). But the overall aim is to raise the level of their civilian economy to the technical level of the other industrial nations.

It is also possible that the internal organization of the Soviet Union in response to the pressures generated by expanded trade with the West may include such reforms as indicators of "profitability," decentralized decisionmaking by enterprise managers, and wage and profit "incentives". Thus, "New planning techniques, a more flexible price system, and increased reliance on market forces are key aspects of the reforms". (p. 22)

As the report pointed out:

> While Soviet reformers have not emphasized the international implications of the reforms, it is clear that a more rational economic decisionmaking structure would facilitate the integration of the Soviet economy into the international economic system. Rationalization of Soviet prices would encourage the importation of goods produced inefficiently by domestic industries. At the same time, by fostering efficiency in domestic enterprises the Soviet Union may be able to expand its exports to Western markets. Moreover, economic reform would remove many of the features of Soviet central planning which inhibit Western businessmen from dealing with Soviet foreign trade organizations. (pp. 23–24)

How the Case Developed

The Hardt-Holliday study traced the uneven course of U.S.-U.S.S.R. trade relations from the 1920s through diplomatic relations and a trade agreement of 1933; at that time the U.S. Export-Import Bank was created to finance trade with the Soviet Union. Then, during World War II, U.S. military and civilian goods were delivered to the U.S.S.R. through the Lend-Lease Program. After 1945 efforts to normalize peacetime trade relations between the two countries and to bring the Soviets into the world economic community were largely abortive. There were several reasons for this failure. As the report observed:

> To a large extent, Soviet foreign economic policy in the late 1940s and early 1950s was a continuation of its prewar strategy of minimizing its economic ties to the industrial West. During the 1930s, Soviet foreign economic relations had been characterized by a policy of self-sufficiency or autarky. Although the importation of high-technology products and, for a time, the services of foreign engineers were permitted to meet high-priority, short-run needs, minimum reliance on the non-Communist world economy was a primary indicator of economic success. (pp. 5–6)

Other factors on the Soviet side were the leadership's ideological hostility toward the United States, unresolved questions of pre-1920 indebtedness of Russia to the United States, and more generally the suspicion of "capitalist" countries and the "Soviet predilection for comprehensive planning and control of the domestic economy. . . ."

"Cold war" attitudes began to harden soon after the close of World War II, with trade declining to a low point in the early 1950s. Soviet moves to relax from an extreme position of autarky in the late 1950s and the 1960s were again set back by the Cuban crisis, the invasion of Czechoslovakia, and the Vietnam War.

On the United States side, "The central feature of U.S. foreign trade policy toward the Soviet Union during the Cold War period was an attempt to deny the Soviet Union the benefits of trade with the more advanced industrial West." There were also allegations of unethical Soviet trade practices such as dumping, pirating of inventions, deliberate disruption of markets, and use of slave labor.

However, during the 1960s, several small steps were taken to expand U.S.-U.S.S.R. trade. U.S. export controls were eased and agricultural credits were extended. By 1966, President Lyndon Johnson was urging increased economic exchanges to "build bridges" to East European countries. (pp. 6–7)

ACCELERATED MOVEMENT TOWARD DÉTENTE

With the advent of the Nixon Presidency, the exploration of means toward détente accelerated. One means of correcting recurring balance-of-payments deficits was expanded trade with the Communist countries to increase exports, production, and employment. A Presidential Commission in 1971 proposed that: "Within the bounds set by strategic considerations, the United States should attempt to expand its trade with Communist countries." Export restrictions and tariffs should be eased and multilateral trade arrangements explored for this purpose. (p. 7)

By the close of 1971 the pace of events quickened. The Peterson Report in December noted that the countries of the Communist world were trading more extensively with the West and urged a new U.S. approach to Communist trade in order to improve the trade prospects of the United States and to open the way for Communist countries to join the world trading and monetary community. (p. 8) In November 1971 Secretary of Commerce Stans went to Moscow to discuss trade matters; he was followed in April 1972 by Secretary of Agriculture Butz. These missions encouraged expectations of a substantial increase in U.S.-Soviet trade. Then in May 1972 came the Summit Meeting at which a Joint Commercial Commission was created to negotiate an overall trade agreement (including reciprocal most-favored-nation or MFN provision), arrangements for reciprocal availability of credit and facilities to promote trade, and an arbitration arrangement to resolve trade disputes. By this time also, the Soviet authorities appeared disposed to press for early resolution of the issues that had obstructed trade between the two countries. Thus:

> On July 8, 1972, an agreement was reached providing credit through the Commodity Credit Corporation for Soviet purchases of American grain. A maritime agreement was concluded on October 14, 1972, which removed several barriers to commercial shipping between the two countries. On October 18, 1972, a commercial agreement and a settlement of the Soviet Lend-Lease debt were signed. The commercial agreement projected a tripling of U.S.-Soviet trade within a 3-year period and provided a number of regulatory measures. The lend-lease settlement arranged a repayment schedule for the Soviet World War II debt to the United States. (p. 10)

Although the discussions of the series of agreements projected optimistic consequences for future trade between the two countries, the significant technological lag of the U.S.S.R. in other areas than military and space offered less reason for these expectations. Soviet economic relations with the West rested mainly on technology transfers to the relatively backward Soviet industries, paid for by exports of raw materials. This structure of trade was unlikely to be quickly altered by the new agreements.

U.S. Involvement

Assessment of the implications for the United States of the trade agreements with the Soviet Union must consider both costs and benefits, problems as well as opportunities, and arrangements to fulfill the expectations raised by the agreements.

It is generally assumed that trade is a means of encouraging more amicable and stable relations among nations. U.S. interest in Soviet trade has tended to reach beyond this generality:

> Although somewhat inconsistent in application, a policy of reward-penalty appeared to be followed by the United States, apparently with three objectives:
>
> (1) To encourage détente by reducing weapons development, lowering force levels, and moderating crisis management;
>
> (2) To encourage détente through moderation and reform of the Soviet regime's domestic policies, including religious tolerance, economic reform, freedom of expression, and the right to emigrate;
>
> (3) To encourage polycentrism in the Communist world, détente in the foreign policies of the individual Communist countries other than the U.S.S.R., and moderation in their domestic policies. (p. 12)

U.S. interest in the effects of expanded trade and détente with the Soviets raises ambiguities in at least four areas: As to whether the U.S.S.R. exerts a moderating influence on world tensions or helps foment dissensions; as to whether Soviet priorities need to shift to meeting consumer requirements or to remain fixed on strategic military weapons; as to whether Soviet internal controls are easing to encourage modernization and professionalism or tightening over civil liberties, emigration, and access to foreign media; and as to increased or decreased independence of satellite countries.

On the commercial side, the question persists as to how good a customer the U.S.S.R. can be. One view, offered in the study, is that "increasing U.S. sales in agribusiness facilities, petroleum and natural gas equipment, computer systems, and a variety of other high-technology lines may be an effective wedge into the Soviet market; once begun, these sales tend to accelerate over time". (p. 44) This principle was extended in the discussion to apply generally to advanced industrial systems, management-control-communications systems, mass production machinery building, agribusiness as both a system and a series of technologies, and tourist systems. The hypothesis is offered that requirements for imports in these areas "appear to represent a pattern of technical and managerial relatedness that would limit the ability of Soviet leaders to take short-term advantages, borrow technology, and then withdraw from continued U.S.-Soviet economic relations in particular lines." (pp. 45–46)

BARRIERS TO TRADE EXPANSION

Again from the U.S. point of view, there are major barriers to the proposed trade expansion. One is the unfamiliarity of U.S. businessmen with Soviet foreign trade techniques. Corporate rights are somewhat imprecisely defined. "One feature of Soviet state trading to which Western businessmen object is the necessity of dealing with Soviet foreign trade enterprises." There is no direct contact with Soviet producers, consumers, and distributors. (p. 63) There is also a tendency for Soviet traders to "insist on barter trade, tied transactions, and other clumsy arrangements." Other barriers are the limited Soviet export capability, the doubtful adaptability of Soviet trade institutions to large-scale economic cooperation, and U.S. resistance to exports with possible "national security" implications. (p. 65)

The report concluded that further trade negotiations between the United States and the Soviet Union, to ease the indicated barriers, called for a considerable mobilization of U.S. talent. "In order to link the broadest security and diplomatic interests with the commercial arrangements, the involvement of high-level policymakers is essential." Also indispensable are "specialists on the Soviet Union, foreign trade specialists, and private businessmen" to provide technical advice. In short:

> The long-term process of negotiation, its specialized character, and the broad national interests inherent in U.S.-Soviet relations require a permanent working blend of experienced people with the following characteristics:
>
> a. Top politicians from both executive and legislative branches, authorized to speak for the White House and Congress as a whole;
>
> b. Government trade specialists from the Departments of Commerce, Treasury, State, and other agencies;
>
> c. Specialists on Soviet political-economic affairs from governmental or academic positions; and
>
> d. Representatives of private business and banking. (p. 77)

Role of Congress

The Hardt-Holliday report pointed out that, "Congress necessarily will be involved in certain aspects of U.S.-Soviet economic relations in the future." For example, "Congressional approval is required for extension of MFN treatment to the Soviet Union". (p. 11) Congressional action would also be required to expand the credit resources of the Export-Import Bank (p. 58) and would be desirable to monitor the various easements in regulation by the administration to facilitate the enlarging pattern of U.S.-Soviet trade.

Although several reports (p. 10) urged the necessity of a "major and direct role of Congress in (Soviet) trade negotiations," no effort was made to involve the Congress in the trade discussions with the Soviets and no enabling legislation was enacted to facilitate the trade agreement. Only after the fact was the Congress asked to extend MFN status to the U.S.S.R. (see especially pp. 48–59)

It appears that a considerably expanded congressional role will be necessary in the future to enable the exercise of constitutional responsibilities of the legislative branch in the conduct of U.S.-Soviet commercial relations. In addition to the actions indicated above, the Congress will presumably be asked for other pieces of implementing legislation, including appropriations; it will have the continuing responsibility for legislative oversight; it will be continuously concerned with the impact on U.S. programs, interests, and economic conditions of trade with the Soviets (grain transactions being an example of this concern); and it will be concerned with the broader impact of the U.S.-U.S.S.R. trade and technology transactions and agreements on U.S. foreign policy in general.

Accordingly, the Hardt-Holliday report suggested that, "it would be particularly beneficial to include Members of Congress in the commercial negotiations"; and that "very careful official and public scrutiny of each step in the progress of the Joint U.S.-U.S.S.R. Commercial Commission discussions would appear to be in order for *both* the executive and legislative branches."

> Congressional involvement [said the report] would permit a broader representation of U.S. public opinion and facilitate passage of legislative measures needed to improve U.S.-Soviet commercial relations. Without continuous involvement of the Congress and private interests, it could be difficult to have an informed debate on important issues. The establishment of a special congressional committee or subcommittee to deal with East-West trade, roughly paralleling the Jackson

subcommittee on SALT, might be appropriate. The creation of the Jackson subcommittee gave evidence of congressional interest, involvement, and authority.

Direct congressional involvement would seem especially desirable in view of the complex, significant, and long-term nature of the U.S.-U.S.S.R. Commercial Commission deliberations. Such involvement on a continuing basis could facilitate effective treatment of issues concerning statutory authority, such as most-favored-nation agreements, and in general those in which congressional interest is high, for example, export-import credits. (Hardt-Holliday Report, pp. 77–78)

Outcome

Unlike the other five cases in the study of Science, Technology, and American Diplomacy, the present case took place only a short time ago. Accordingly, it would be premature to attempt a factual description of its consequences. An assessment of possible and probable future outcomes is offered in the section to follow, drawn from the Hardt-Holliday study of 1973, and a reassessment by Dr. Hardt in 1975 follows thereafter. The legislative consequences that flowed from the U.S.-U.S.S.R. trade agreements are summarized by Dr. Hardt, in 1975, as follows: Congress passed the Trade Act of 1974 (Public Law 93–618) and the Export-Import Bank Amendments of 1974 (Public Law 93–646) at the close of the 93d Congress. Earlier, the Export Administration Amendments of 1974 (Public Law 93–500) were passed in October 1974 dealing with export controls. They were signed by the President on January 3 and 4 respectively. The Jackson-Vanik amendment to the Trade Act conditioned the extension of MFN status to the Soviet Union on liberalization of Soviet emigration policies. Both laws placed a ceiling of $300 million on credits from the Eximbank to the Soviet Union during the 4 years of the new law.

Assessment

The Hardt-Holliday study concludes that: "The policies followed by the United States and the Soviet Union will greatly influence the probabilities of alternative outcomes." More specifically, adoption by the Soviets of a consumer-oriented policy would divert resources and policy emphasis from a military buildup. On the U.S. side, the Soviet policy of grain purchases would encourage extension of the interdependent relationship between the two superpowers into other economic linkages. Inasmuch as Soviet policy objectives are "especially crucial to such a projection," certainty is lacking as to which of different alternate courses—or what compromise among them—the Soviet leadership will adopt. (p. 78)

As the report observed:

> The changes that have already been made seem likely to strengthen trade ties between the United States and the Soviet Union, but many obstacles to completely normalized economic relations remain. The long-run growth of Soviet-American economic relations will depend in large part on the continuation of the liberalization process. (p. 65)

A matrix might be drawn up of possible outcomes and their effects, for the United States and the Soviet Union, of; (a) exports from the United States to the Soviet Union; (b) exports from the U.S.S.R. to the United States; (c) technology transfers from the United States to the Soviets; (d) economic changes in the United States as a consequence of the trade pacts; (e) economic changes in the U.S.S.R.; (f) political consequences for the United States; and (g) political consequences for the U.S.S.R. For some cells in the matrix there are fairly high probabilities; for others the forecasts are contingent on political developments and policy decisions. However, a few conjectures on parts of the matrix are offered as follows:

U.S.-U.S.S.R. TRADE PROSPECTS

Although starting at a low level, with the exception of imports of grain, the U.S.-Soviet trade prospects are judged likely to grow at a substantial rate.

> Current projections indicate a substantial increase in U.S.-Soviet economic exchanges. Improved economic relations are officially considered to be part of a pattern of changing U.S.-Soviet relations in many areas. The trade agreement, along with the summit agreements on strategic arms limitations and other matters, links national security considerations, economic relations, technology policy, and the conduct of diplomacy between the two major powers. President Richard Nixon and Soviet Communist Party Secretary Leonid Brezhnev both postulate that the changes occurring in U.S.-Soviet relations will influence the stability of the international community for some years to come. (p. 3)

Traditional Soviet exports have included fur skins, nickel, palladium, platinum, chrome ore, crude oil and petroleum products, coal and coke, cotton, wood and wood products, diamonds, inorganic chemicals, and nonferrous metals. Expansion of U.S. imports of Soviet products subject to tariffs are dependent on MFN status for the U.S.S.R. While the structure of Soviet exports is heavily biased toward raw materials, foodstuff, and semimanufactures, Soviet officials have indicated a desire to expand their export portfolio into machinery and equipment, more intensively technological in character. These include:

> *Machinery and mechanical equipment.*—Forging and pressing equipment; rolling equipment; mining machinery; power equipment—hydraulic and steam turbines; machinery for food preparation; textile machines; printing equipment; road-building machinery; and parts of machines—antifriction bearings.
>
> *Electrical machinery and equipment.*—Generators; transformers; radio receivers and components; and electronics components.
>
> *Transportation equipment.*—Aircraft—supersonic airplanes, helicopters; motorcycles; seagoing freighters—tankers, dry cargo; seagoing passenger ships—hydrofoils; and tractors.
>
> *Miscellaneous equipment.*—Measuring instruments—optical, meteorological, et cetera; medical equipment; tools, watches and components; cameras, photographic accessories; and movie projectors and accessories. (p. 36)

More broadly, Soviet dollar earnings were considered in the report as likely to come from the following sources:

> (1) Increased Soviet exports of raw materials, such as energy sources and metals, and industrial goods;
>
> (2) Gold sales;
>
> (3) Nontrade income, such as tourism and shipping;
>
> (4) Multilateral relations, such as balancing a trade deficit with the United States by a trade surplus with Japan;
>
> (5) Cooperative ventures; and
>
> (6) Credits (only a short-term consideration, as eventual repayment is required, plus interest). (p. 33)

In assessing the prospects for Soviet export trade to the United States the report noted a number of significant variables: (a) Soviet willingness to shift exports of oil and gas from other markets, including domestic and Comecon, to the United States, (b) trade credits available to the U.S.S.R. from the Export-Import Bank, the Commodity Credit Corporation, and private sources, (c) U.S. willingness to extend most-favored-nation status to the U.S.S.R., and (d) Soviet ability to mobilize production of items for Western markets. (p. 41)

Apart from emergency demands for grain to make good the shortfall of Soviet harvests, Soviet representatives appear most interested in imports in which the United States has a degree of technological leadership, such as:

> (1) Large-scale petroleum and natural gas extraction, transmission, and distribution systems, including special permafrost problems and oil recovery systems;
> (2) Management control systems utilizing computer facilities;
> (3) Mass production machinery output, such as of trucks and cars;
> (4) Animal husbandry as characterized by U.S. agricultural business; and
> (5) Tourist systems including hotels, packaged tours, and transport.
> Each of these technological areas requires large-scale financing, consortium operations, and marketing systems. The experience of U.S. multinational corporations might lend itself to industrial cooperation with the Soviet Union. (p. 31)

However, the report concluded that the volume of Soviet exports to the United States is unlikely to reach a large share of either U.S. trade or GNP. The U.S. advantages as likely to center on such specifics as imports of oil and gas and exports of feed, cereal grains, and computers and other high technology products.

POLITICAL CONSEQUENCES

The report strongly suggested that the thawing of the Soviets toward trade relations with the United States is attributable to an "apparent reordering of Soviet priorities," in favor of "technological change and an improvement in the availability of desirable consumer goods to the Soviet workers and peasants." The extent of this reordering "turns in large part on how much of the Soviet output goes to defense and on the volume of Soviet trade with other nations." The question is whether military priorities will be sustained along with the increased emphasis in other areas, or be superseded by nonmilitary economic activity. Even the prospect of a change in priorities gives rise to some hope of a relaxation of the arms race. Thus:

> . . . if the Soviet Union should reorder its priorities and permit more foreign decisionmaking involvement in domestic cooperative ventures, significant long-run benefits of a predominantly political nature might accrue to the United States such as: (a) the potential reduction of the Soviet threat to our security from reordered Soviet priorities; (b) a degree of Soviet acceptance of the international system, implied by the U.S.S.R.'s permitting domestic involvement of foreign corporations as partners; and (c) political advantages inherent in increasing international commercial and financial intercourse. Overall, such political gains might far outweigh the relatively modest economic returns. (pp. 74–75)

The report identified three political costs to the United States that warrant attention:

> 1. The risks involved in the unreliability of the Soviet Union as a supplier of important raw materials. Reliance on the Soviet Union as a source for vitally needed energy resources appears to be a particularly risky undertaking.
> 2. Contributions to the Soviet fund of technical knowledge that could be translated into security programs or which could result in the release of resources for military programs.
> 3. Potential leverage to the Soviet Union that could result from Soviet control over U.S. investments and personnel—a possible source of economic blackmail, or an economic hostage system.

There were also three possible political benefits:

> 1. Soviet reliance on the United States as a source of supply and expertise. Soviet dependence on U.S. agricultural products and advanced technology, for example, is a potential source of U.S. political leverage.

> 2. Encouragement to the Soviet Union to reorder priorities between military and civilian programs. Expanded commercial relations may serve as an economic reinforcement of the arms control and other agreements between the two countries.
> 3. Encouragement of domestic change in the Soviet Union. The presence of many American citizens in the Soviet Union with some decisionmaking power and a wider exchange of ideas may in the long run contribute to a moderation of the Soviet political control system and command economy. (p. 73)

RISKS VERSUS POTENTIAL GAINS

On balance, the political risks to the United States were larger and longer range; the economic gains to the Soviet Union were surer and earlier. In particular, the transfers of U.S. technology to the U.S.S.R. might yield only long-term political and diplomatic benefits to the United States.

Still, the report offered two summary assessments of a hopeful character for U.S.-U.S.S.R. diplomatic relations. The first involved internal Soviet policy.

> Three options for economic change open to the Soviet leadership are, in order of probability: (1) a reduction of the priority for new strategic weapons systems; (2) a cutback in military manpower; and (3) a withdrawal of party control and involvement in the economy so as to permit improved efficiency through economic reform. All are issues which will be influenced by both the international situation and domestic political considerations. A downward revision in the priority for further military weapons buildup, for example, is likely only if the economic rationale is persuasive and the domestic political and international climate are favorable. (p. 29)

The second assessment, while warning of the hazards of the situation, suggested that there could be important benefits in the promotion of closer Soviet economic relations with the United States and the rest of the non-Communist world.

> In summary, expanded economic relations which facilitate massive technology transfer from the United States to the U.S.S.R. may create new, potentially dangerous dimensions in U.S. diplomacy. On the other hand there is at least a possibility that the process of integrating the centrally planned Soviet economy into the market economy of the United States and the rest of the non-Communist world might unleash irreversible forces of constructive change which could, in turn, contribute to international interdependence and stability. (p. 73)

Author's Reassessment in 1975

This case was revisited by one of the authors (Dr. John P. Hardt) in 1975 to ascertain what relevant changes in outlook had occurred in the intervening 2 years. His reappraisal, and a list of questions posed in the original study and in the 1975 review, conclude this abstract.

EAST-WEST TRADE IN PERSPECTIVE

U.S. trade with the Communist world has grown rapidly in the 1970s. While it is still small in comparison with overall U.S. foreign trade, considerable significance has been attached to East-West trade because of the prospects for future growth and, more importantly, because of the linkage of commercial ties with East-West political relations. Congressional consideration of important legislation relating to East-West trade has been influenced by increased interest in the U.S. business community in trade with the East, continued efforts by the administration to achieve détente with the Soviet Union and China, and controversy about certain aspects of Soviet foreign domestic policies.

Following the passage of important new legislation in 1974–75, it is clear that the Congress has reassigned itself a continuing role in trade, Government finance, and export control. The executive department must now make detailed reports to the Congress on the bases for its actions and, in many specific instances, receive explicit congressional approval. In other cases, prenotification of Congress permits nullification of executive action by Congress.

EXPANSION OF TRADE AS ELEMENT OF DÉTENTE

One of the major aims of the policy of East-West détente pursued by the Nixon-Ford administrations has been a rapid expansion of commercial relations between the United States and the Soviet Union, People's Republic of China, and the countries of Eastern Europe. East-West commercial ties have been deliberately promoted by the past and current administrations and the governments of the non-Communist world as a means of easing international tensions. Trade promotion in the East has been more related to perceived economic need. The linkage of commercial relations to political goals in U.S. policy toward the East is not new: precedents were set by President Kennedy's approval of large-scale sales of wheat to the Soviet Union in 1963 and later by President Johnson's policy of building bridges to the Communist world. However, neither of the earlier more limited attempts succeeded either in achieving a major expansion of U.S. trade with the East or attaining significant political gains.

In 1970, U.S. trade with Communist countries was at a very low level: Trade turnover totaled $580 million. From 1971–73, trade expanded rapidly, and in 1973 was $3.07 billion. Most of this trade was with the Soviet Union ($1.4 billion) and the People's Republic of China ($750 million). The expansion in 1974 was modest, to $3.3 billion, the major portions with the U.S.S.R. ($961 million) and the People's Republic of China ($935 million). Although relative increases were significant and most projections for 1980 suggest a substantially higher level, the aggregate trade's impact on U.S. balance of payments and domestic income and employment is likely to be modest. However, with a $3 billion global deficit in balance of payments for 1974, East-West trade provided a $1.2 billion surplus. Some sectors of the U.S. economy, such as producers of heavy or extractive equipment, computers, agricultural goods, automotive machinery, and tourist services are likely to receive considerable benefit. Whereas exports to Communist countries may be a major factor in some export sales, they will probably remain a small share of total U.S. output.

PAST U.S. LEGAL RESTRICTIONS

Various U.S. legal restrictions have constituted an important reason for the past low level of U.S. trade with Communist countries. Three of the most important restrictions—denial of most-favored-nation status (MFN), restrictions on U.S. Government credits, and export controls—were reviewed by the 93d Congress. The importance of MFN and Government credits (particularly Export-Import Bank credit) lies in the difficulty that Communist countries have in paying for their imports from the West. For example, the United States had a balance-of-trade surplus in its East-West trade of $1.9 billion in

1973 and $1.2 billion surplus in 1974. Denial of MFN contributes to this imbalance because higher tariffs tend to drive up the prices of Communist countries' exports and thus reduce their ability to sell in the U.S. market. Restrictions on Government credits have denied some Communist countries access to a facility which continues to play an important role in financing U.S. foreign trade—the U.S. Export-Import Bank. The impact of denial of MFN and credits on trade varies from country to country. Some suggest the major impact on the U.S.S.R. currently is political. Export controls prevent the export of certain kinds of goods and technology which are considered to have military applications. In the past, such controls have been applied particularly to the kinds of goods which Communist countries are most interested in importing from the West.

RECENT MOVES TOWARD LIBERALIZATION OF TRADE

In recent years, several attempts have been made to liberalize the legal framework for East-West trade. Although only Poland and Yugoslavia at present receive MFN treatment, there have been proposals to extend it to the Soviet Union, the People's Republic of China, and several East European countries. Those countries had been barred from receiving MFN by section 231 of the Trade Expansion Act of 1962, as amended (19 U.S.C. 1861). The Trade Act of 1974 (Public Law 93–618), enacted on January 3, 1975, provided that MFN status might be extended to the Soviet Union and other non-market economy countries. The continued availability of MFN status, once granted, was to be based on a congressional assessment of the Eastern countries' adherence to standards of free emigration, as stated in the Jackson-Vanik amendment to the act and related written exchanges between Senator Henry Jackson and Secretary of State Henry Kissinger. In January 1975 the Soviet Union, when offered MFN as the operative condition for bringing the October 1972 U.S.–U.S.S.R. commercial agreement into force, refused to accept the conditions. The refusal brought into question Soviet willingness to continue payments on its Lend-Lease debt. The Soviets had agreed to make three payments totaling $48 million (the third payment of $12 million was due and paid in July 1975). They agreed to make further payments through July 1, 2001 (total repayment would be $722 million) on the condition that the Soviet Union was granted MFN treatment. Although the Soviet Union made its rejection of the Jackson-Vanik amendment clear, other controlled economies, such as Romania's, have moved toward further trade normalization and MFN acceptance. In April 1975, the Executive provided MFN to Romania, contingent on subsequent congressional approval.

Government credits were also tied through the provisions of the Jackson-Vanik amendments to the trade bill. The new legislation, the Export-Import Bank Amendments of 1974 (Public Law 93–646), also singled out the Soviet Union for special constraints on the level of credits and the use to which credits were to be put: limit of $300 million in 4 years, with a mechanism for congressional approval for more credits based on a detailed national interest determination; strict limits on energy-related activities to research, development, and exploration; and, even therein, limits on each project of $25 million per project and total of $40 million over 4 years, without congressional approval for more. The export-import facilities remain available to Romania, Yugoslavia, and Poland.

The export control authority has been extended and modified by the Defense Appropriation Authorization Act of 1975 (enacted August 5, 1974, as Public Law 93-365) and the Export Administration Amendments of 1974 (enacted October 29, 1974, as Public Law 93-372). These two pieces of legislation continued the narrower definition of national security to defense-related products and processes rather than including industrial potential, as had been the case in the law before the Export Administration Act of 1969 (Public Law 91-184). However, in the legislation of the 93d Congress an unsuccessful attempt was made to enhance the role of the Secretary of Defense in the determination of defense-related goods and processes. Concern was also specifically expressed about the export of products of short supply (e.g., energy, food, or feed-related products).

The net effect of the restrictive congressional legislation of the 93d Congress and the Soviet deferment or nullification of the commerical agreement has been reappraisal of East-West trade on all sides. A new agreement between the Congress and the executive department and a new understanding between the Soviet Union and the United States may result prior to or during the oft-postponed summit between Leonid Brezhnev and Gerald Ford in Washington.

Any redefinition is, however, likely to retain a reasserted and expanded congressional role and voice on tariff, credit, and export policy of the United States in East-West trade.

Some Illustrative Questions

Should the United States grant trade benefits to governments which pursue hostile foreign policies and repressive domestic policies?

Will increased U.S. trade with Communist countries help to bring favorable change in their policies?

Will exports of U.S. technology, often assisted by low-cost Government credits, assist the economic and military development of Communist countries?

Will the United States receive significant economic benefits from East-West trade?

Should the United States make exceptions to its general long-run policy of advocating unrestricted international trade?

Is there a danger that the United States might become dependent on Communist countries for important raw material supplies?

What effects are increased economic exchanges, especially in technology-intensive products, likely to have on U.S. foreign policy goals and on U.S. national security?

What technological contributions will U.S.-Soviet commercial exchanges make to American industry?

What risks will these exchanges pose to specific U.S. industries and industrial corporations?

Does the Soviet leadership perceive as yet the need for serious changes in internal planning and management to rationalize production to satisfy market needs? At what point will the leadership see the cost of not changing as greater than the cost of change?

Does the sale of U.S. high technology products to the Soviet Union encourage or discourage Soviet military preparedness?

Do Soviet requirements for U.S. technology require longer periods of commitment than was the case in the past?

Does the trade agreement represent a part of a new pattern of relationship between the Soviet Union and the United States?

Does the agreement presage a new relationship between the Soviet economy and the non-Communist world economic system?

How can economic exchanges with the Soviet Union, particularly those involving technology transfers, be used to further U.S. foreign policy?

What changes are needed in negotiating procedures and commercial institutions to insure that the United States maximizes its political and economic benefits?

In light of past grain sales, the question is important as to how good a market the Soviet Union really is for U.S. exports and how the United States may have to change its marketing procedures to deal effectively with the East.

And also: how good an investment for the United States is Soviet exploitation of petroleum, natural gas, or other raw materials?

IV. SIX SUBSTANTIVE ISSUES WHICH FURTHER ILLUSTRATE THE INTERACTION

The remarks introducing section III apply to this section as well. The format governing the commentaries to follow differs only slightly from that used in summarizing the six cases just presented:

Statement of the issue
Importance of the issue
How the issue developed
U.S. involvement
Role of Congress
Status of the issue
Prospects and options
Author's reassessment in 1975/1976
Some illustrative questions

ISSUE ONE—THE EVOLUTION OF INTERNATIONAL TECHNOLOGY

Statement of the Issue

This initial study [104] was designed to provide an overview of the subject, and at the same time to express a common theme for the series. Thus:

> The focus of this chapter is on technology. It is intended: To delineate the important ways in which technology influences diplomacy; to show technological change as a process producing effects that diplomats must deal with; and to raise questions as to whether and how governments can make purposeful, constructive use of these processes to further diplomatic objectives.[105]

The theme was stated in universal terms, but an assumption of the study series was—and remains—that the United States could further its interests and its position in the world by systematically and judiciously exploiting its technological skills and resources. Six years and 12 studies later, however, the project director and associate director find themselves impressed not so much by the opportunities (though these are many and great) as by the dimensions of the obstacles to their realization, and by the lack of appreciation even in the United States itself of both the opportunities and the obstacles. In the world at large, irresponsible expressions of nationalism and independence oppose the working out of acceptable accommodation with the imperatives of technology-induced interdependence. There is evidently a dearth of national and world leadership that sufficiently comprehends and takes determined steps to direct the dynamics of technological change. Also largely lacking are concepts and machinery of mid-range and long-range planning for both U.S. and global growth and development which take appropriate account of the likely impacts of further technological advances. The rising dangers of drift, drag, and decay threaten everywhere.

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[104] U.S. Congress, House, Committee on Foreign Affairs, *The Evolution of International Technology*, a study in the series on Science, Technology, and American Diplomacy prepared for the Subcommittee on National Security Policy and Scientific Developments by Dr. Franklin P. Huddle, Science Policy Research Division, Legislative Reference Service, Library of Congress, Washington, D.C., U.S. Government Printing Office, December 1970, 70 p.
[105] *Ibid.*, p. 1.

But times of uncertainty and flux are not new in history, and despair has never been an answer to human problems. An important part of the answer to the problems of civilization today lies in better understanding of the changes being wrought in the world by technology and in efforts to direct these changes. The present study, and the Science, Technology, and American Diplomacy series as a whole, represent an attempt to contribute to such understanding.

Importance of the Issue

The influence of technology in human affairs is pervasive and profound. As Vietnam reminds us, technology may not be the decisive force in resolving a given issue in some particular situation, but its cumulative impact on people's lives all over the world is nonetheless powerful, and growing. Its growth is so dynamic, indeed, that some critics would arrest it altogether if they could, professedly to save the world from mind-boggling excesses of human inventiveness. Other more optimistic analysts, noting that for the first time in history it is technically possible—given the will, and effective planning and organization—to eradicate famine, epidemic disease, and other impediments to the physical well-being of the world's peoples, argue for actively controlling and directing technology to make it serve the greatest good of the greatest number.

Whatever the point of view, technology will increasingly be a force to reckon with. The responsibility for reckoning with it, while in part diffused among such extranational instrumentalities as multinational corporations and agencies of the United Nations, is mainly vested in sovereign nations, which may or may not rise to the challenge. Diplomacy is the instrument in dealings among sovereign nations. It is therefore important that the association between technology and diplomacy, which in the past has tended to be formal, limited, and contrived, become increasingly close, continuous, and comfortable.

How the Issue Developed

This study has for its subject the full range of applications of technology to human affairs. It explores the history of how these applications have proliferated since the beginning of the industrial revolution and in a more intensive way since World War II.

Technology, as used in the study series, is a comprehensive term "covering a wide variety of scientific and technical activities and products. In its simplest usage, it merely signifies 'tools.' At the other extreme, it conveys the broad meaning of 'how man works.' "[106] In the context of planned activity it "signifies the systematic, purposeful application of knowledge to modify an environment toward predetermined goals."[107]

Foreshadowing the more detailed treatment of the interrelationships of technology and diplomacy 4½ years later in the last of the12 studies, *Science and Technology in the Department of State: Bringing Technical Content Into Diplomatic Policy and Operations*, this early study spoke of "Technology as the Underpinning of Diplomacy":

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[106] *Ibid.*, p. 2.

[107] Huddle, *The Mekong Project*, p. 1 (footnote). See also Huddle, *Science and Technology in the Department of State*, Introduction, pp. 1-10.

> The profound influence that technological change has had in the past, and promises to have for the future, implies the need for a strong crops of diplomats trained to anticipate and prepare for the direct and indirect impacts of technology on diplomatic concerns . . . "[108]

Diplomacy, the study continued, deals with problems between sovereign nations and with the common concerns of members of the world community of nations. "The objective of diplomacy is to reconcile or resolve issues and establish agreements to advance the national interest in a constantly changing world. Changes within the jurisdiction of each member of the world community alter its relations with others. No source of change is more potent than an alteration in a nation's technological condition."

> It produces changes of many kinds at many levels of impacts and interactions: military, commercial, cultural, political, and scientific; these changes involve many agencies of government, the academic world, private business, and the public at large. Familiarity with technology, and with the nature of its impacts, is thus an indispensable tool of the diplomat. Moreover, the skill with which a nation manages and advances its own technology contributes to the status of its diplomats, and to the options with which they can negotiate. In both senses, national technology confers diplomatic power.[109]

TECHNOLOGY AS A PRIMARY SOURCE OF NATIONAL POWER

But the point can be made even more strongly: ". . . technology is a *primary source* of *national power* and diplomatic influence."[110] (Emphasis added.)

The story of how technology has progressively affected human civilization is too long, and too familiar, to be retold here. The reader interested in detail is referred to *The Evolution of International Technology* or—since even this is a highly abbreviated account—to the definitive treatment contained in the five-volume work, *A History of Technology*.[111] The following account is limited to a few reminders of the history of the past century:

> "Early in the industrial revolution, a race began for both overseas markets for manufactured goods and supplies of needed raw materials. In this race the process was one of commercial penetration, followed by military enforcement of commercial rights."[112]

From the close of the Napoleonic Wars to the latter part of the 19th century, England was technologically and industrially the dominant nation of the world. Between 1870 and 1895, Germany surpassed England and assumed world technological leadership. "On the eve of World War I, Germany's energy showed itself in many ways: in ambitious plans for a railroad line to the Middle East, construction of a modern war fleet, development of African colonies, and the prospect of hegemony over the European continent. When the war broke out, Germany's superior technology very nearly enabled her to overmatch the combination of England, France, Italy, and Russia."[113]

So strong was the emphasis in German education on technological skills and innovation that even after defeat in 1918, followed by two decades of social upheavals, inflation, political instability, and finally "a dictatorship too erratic in its concepts to exploit systematically the undoubted talents of its people in science and technology," [114] German technological prowess was still evident in the V-2 ballistic rockets, one of the major achievements in World War II.

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[108] Huddle. *The Evolution of International Technology*, p. 1.

[109] *Ibid.*, p. 2.

[110] *Ibid.*, p. 9.

[111] Charles Singer, E. J. Holmyard, A. R. Hall, and Trevor I. Williams, eds., *A History of Technology*, New York, Oxford University Press, 1958, 4011 pages, 240 plates.

[112] Huddle, *The Evolution of International Technology*, p. 10.

[113] *Ibid.*, pp. 10-11.

In the main, though, the United States assumed world technological leadership from the close of World War I. From then on, and especially after World War II, the development of international technology centered so heavily on the United States that it seems appropriate to consider its further progress in the section on *U.S. Involvement*, below. However, some general observations about the growing impact of technology on human affairs, gleaned from the study, may be noted first:

DIMENSIONS OF THE IMPACT OF TECHNOLOGY ON SOCIETY AND ON DIPLOMACY

Five of the dimensions which characterize the role of technology today are especially noteworthy: its accelerated *pace*, the *size* to which its applications may attain, the formidable *complexity* of some of its more advanced systems, its flourishing *variety*, and the *range and pervasiveness* of its impacts.

The *pace* is everywhere evident in technologically advanced countries: witness, for example, in the United States today, the use by school children of the pocket computer, a device which did not even exist (at least in marketable form) a decade ago. The accelerated pace of technological innovation and change poses problems for diplomacy. It "increases the rate at which international issues, problems, and opportunities arise. It confronts the diplomat with an ever-lengthening agenda, the need for a deeper understanding of the processes of change, and the requirement for a great increase in the orderly flow of exact information concerning its ingredients." [115]

As to *size*. "Although historical achievements in technology have sometimes approached heroic proportions (the Pyramids, Roman roads, the Great Wall of China, and the Panama Canal, for example), the size and cost of some of the modern technological systems is quite unprecedented. Most notable are those in the field of military hardware, such as . . . the Polaris system, and nuclear test detection systems. Others include spacecraft like the Apollo series, global communications networks, air traffic control systems, a global weather forecasting network, the Interstate Highway System, electric power grids, and the complexes of multipurpose dams on the Tennessee and other major rivers." [116] Large technological projects of an inherently international character, observes the study, impose added burdens on the diplomat. Problems and benefits must be shared among many nations; acceptance of roles of participation must be negotiated; new mechanisms of diplomacy are required. An illustration from the mid-nineteenth century—one which may seem small-scale today, but which was ambitious enough for the time—is found in the difficult and frustrating, though ultimately successful, efforts of diplomats and scientists from 12 nations to work out an international quarantine convention, as described in *The Politics of Global Health*.[117] Numerous current examples involving problems of larger scale (both technologically and diplomatically) could be cited: e.g., in the area of international agreements on the use of earth satellites for television broadcasting or for earth resources surveys.

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[114] *Ibid.*, p. 11.

[115] *Ibid.*, p. 3.

[116] *Ibid.*, pp. 3-4.

[117] U.S. Congress, House, Committee on Foreign Affairs, *The Politics of Global Health*, a study in the series on Science, Technology, and American Diplomacy prepared for the Subcommittee on National Security Policy and Scientific Developments by Freeman H. Quimby, Science Policy Research Division, Congressional Research Service, Library of Congress, Washington, D.C., U.S. Government Printing Office, May 1971, 79 pages. (committee print.) pp. 7-8.

The most recent step in the centuries-old, but rapidly accelerating, progression from simple manual tools to systems of great *complexity* has been the introduction of computers into large systems to automate the making of routine decisions in their management. "These systems have now become so complicated in design and function that even to build them has come to require elaborate systems of planning and control, and these have also required the assistance of computers." [118] This complexity too adds to the problems and opportunities of diplomacy:

> On the one hand, complexities of systems design present formidable obstacles to quick understanding of these large enterprises. On the other hand, it has been suggested that the disciplines and orderly methodologies they require can make a direct contribution to the processes of diplomatic analysis and problem solving.[119]

By way of example, complex systems like air transportation and satellite communications "can serve both to help and hinder the work of the diplomat: While information can now be transmitted virtually instantaneously, to facilitate long-range bargaining, the time available for decisionmaking has decreased. The traditional conduct of secret, official diplomacy tends to be frustrated by radio and television propaganda and by educational, cultural, and scientific exchanges. Swift transit of trouble-shooting negotiators to points of tension by air transport or for consultation with national leaders is counteracted by the ability of troublemakers and dissident groups to use these same means of travel." [120]

The *variety* of technological innovations to which the individual citizen is now exposed "seems to have increased by orders of magnitude in the past quarter-century. . . . The innovative trend is indicated by the automation and productivity of agriculture and industry; the great variety of consumer goods in the home; . . . the introduction of computers into banks, brokerage houses, ticket offices, the management of credit cards, and other services; . . . and the great range of different vehicles in service in the air, on the highways, and in shops, airports, heavy construction projects, and urban areas." And here again there is an added burden on diplomacy: "Assigning priorities among a growing array of salient developments becomes increasingly difficult as a problem of formulating and implementing foreign policy." [121]

The *range and pervasiveness of impacts* of onrushing technology are evidenced in many ways. Historical concepts of war, including the Von Clausewitz doctrine of war as a continuation of diplomacy by other means, have been overtaken by atomic weapons and their long-range delivery systems. "Industrial productivity, supported by technological innovations, has risen so greatly in relation to hours of work that a 'postindustrial' condition can be foreseen in which standards of living will no longer be limited by the length of the workweek." The future adequacy of mineral and fuel supplies is increasingly threatened as production and consumption continue to rise. Impacts of escalating generation of power on environmental quality are a source of growing public and professional anxiety. Imperfections in technology are more and more coming under attack, as in the cases of air and water pollution, noise, radiation, thermal effects, solid waste, and accumulations of toxic materials. Problems of information overload confront technologists in fields of medicine, of properties of materials, and of scientific discoveries generally. With continued global growth in both the uses and the adverse side effects of technology in prospect, the leading technological nations—of which the United States is the foremost—are increasingly confronted with awkward diplomatic problems.

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[118] Huddle, *The Evolution of International Technology*, p. 4.
[119] *Ibid.*
[120] *Ibid.*, p. 42.
[121] *Ibid.*, p. 5.

U.S. Involvement

Many factors—geographic, historical, sociological, and economic—contributed to the emergence of the United States as the technologically most dynamic Nation of the world:

> An unpeopled continent with rich natural resources and temperate climate was settled by immigrants who tended to be self-selected for initiative [and] independence. . . . A chronic labor shortage automatically placed value on labor-saving devices and machinery. These combined to sustain rapid progress in technological innovation toward high manpower productivity and swift economic growth.
>
> Foremost among the new Nation's needs were roads, canals, and a postal system, all of which the early Government undertook to provide. Later, the railroad and telegraph were eagerly seized upon to link up throughout all parts of the Nation the flow of goods and information.
>
> The American Civil War had a profound effect on technology. For the first time, ". . . the technological resources of a whole Nation were ultimately mobilized to overwhelm an opponent. There was mass production of weapons and ammunition, of uniforms and boots; canned food was supplied to armies transported for the first time by rail."[122]

Thereafter came great industrial growth, characterized by the expansion of the railroad network throughout the United States, heavy output of steel, the mass production of lighter engineering products (agricultural equipment, the typewriter, the sewing machine, and the bicycle), and radical improvements in the metalworking machine tool—which (to quote Walt W. Rostow):

> . . . comes as close to being a correct symbol for the second phase of industrial growth as the railway is for the first. And, by the 1890s, electricity, chemical, and automobile industries, which were to play an extremely important part in the third phase, were commercially in being, the first two rooted in new and expanding fields of science and technology.[123]

The opening of the 20th century was marked by two important new trends which heightened the intensity of U.S. exploitation of industrial technology. One was the appearance of the large industrial laboratory; the other was the rapid spread, by the Taylor Societies, of the doctrine of "scientific management." The great industrial laboratories made products better and scientific management made them lower in cost.

"World War II dramatized the importance of science for military power, but as a practical matter it was technology that proved itself of importance":

> Trained American scientists, with an impressive supplement of refugee and British scientists, were able to turn themselves into technologists to serve a great national and international purpose. In 1945, when the scientists called attention to the opportunities of the "endless frontier" of science, and urged its public support, they based their claim on the proposition that investment in

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[122] *Ibid.*, p. 12.
[123] *Ibid.*, p. 12.

research and education in the sciences would automatically reward society—would stimulate innovation, and develop opportunities for an expanding economy—in addition to its having military implications. When their appeal was heeded, beginning about 1950, a veritable explosion, scientific and technological, took place.[124]

ELEMENTS OF U.S. TECHNOLOGICAL STRUCTURE

By 1970 the United States, combining a high-consumption economy with a heavy emphasis on scientific innovation, had built a technological structure that included the following principal elements:

> A large number of very large, efficient, highly productive, geographically extended business enterprises with families of satellite suppliers of materials, components, and specialized services, comprising complex, interconnected, production-distribution-service enterprises; separation of business ownership from business management; and a great increase in policy, planning, and administrative staff in the management of enterprises of all kinds.[125]

The two decades following the outbreak of the Korean War were a period of great ferment, with intensive U.S. efforts in both military and nonmilitary research and development. In his book about American technological dominance, *The American Challenge* (1968), French writer J. J. Servan-Schreiber observes that from the launching of the first Sputnik (October 1957):

> American power has made an unprecedented leap forward. It has undergone a violent and productive internal revolution. Technological innovation has now become the basic objective of economic policy. In America today the government official, the industrial manager, the economics professor, the engineer, and the scientist have joined forces to develop coordinated techniques for integrating factors of production. These techniques have stimulated what amounts to a permanent industrial revolution.[126]

But accompanying the "leap forward" were some fumbling backward and sideways steps, at least in the area of technological inputs into American diplomacy. With the outstanding exceptions of the highly successful Marshall Plan to restore European industry after World War II and the U.S. role in the emergence of a new Japan, and except also for the technological coup of the Berlin airlift, U.S. employment of technology as an instrument of foreign policy enjoyed limited success. The Korean War, and the Vietnamese conflict later on, demonstrated "the serious, painful, and frustrating limitations of technology in waging a limited war against a highly organized and resourceful, if technologically unsophisticated, adversary."[127] The Soviet Union achieved brilliant if temporary diplomatic advantages with its unexpectedly fast development of fission and then fusion weapons, and with the launching of Sputnik I. Subsequent world admiration for U.S. space achievements "was tempered by reservations over U.S. inability to solve such domestic problems as pollution, crime, and highway accidents . . ."[128] Some constructive international applications of U.S. technology proved to have awkward side effects: for example, the insecticide DDT played an important part in malarial control but came to be recognized as ecologically undesirable. Various nations, both developed and developing, became concerned over the "brain drain" to the United States. (See Issue

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[124] *Ibid.*, p. 13.
[125] *Ibid.*
[126] *Ibid.*, p. 14.
[127] *Ibid.*, p. 16.
[128] *Ibid.*, p. 17.

Five for an analysis of this problem.) The territorial sovereignty concept in international law and the issue of ownership of the ocean floor came increasingly into question; the United States often did not succeed in developing diplomatic solutions to protect its own interests and that of its nationals in this critical sphere, or alternatively to reach harmonious international understandings in the interests of all. (See Case Five.)

The rise of the multinational corporation, gaining impetus from "the opportunity seized by American entrepreneurs to exploit U.S. computer and electronic technologies in European markets," [129] created complex policy problems for the U.S. Government and raised questions as to proper relationships and degrees of control. Even the innovative "Green Revolution," which seemed to buy time for the search for solutions to the ultimate human problem of balancing food and population (see Issue Three), proved to have its special technological problems and political dangers. "Thus, by the close of 1970, it was evident that U.S. technology had not been an unqualified success in furthering either U.S. foreign policy objectives or the aspirations of the world at large":

> The undoubted promise of technology had not achieved fulfillment. It was not clear why. Was it because technologists were unable to produce unflawed innovations? Were the diplomats unable to specify the performance of technologies for global effects? Was there an insufficient coupling of technologists with diplomats to achieve proper teamwork toward a successful product? Where did—and do—the weaknesses lie? [130]

The outstanding development in technologically based diplomacy in the 5-year period since December 1970 has been the setback suffered by the oil-dependent nations at the hands of the oil producers—a setback which compounded a major world economic recession already underway. As of December 1975, the foregoing questions seem more insistent than ever.

Role of Congress

As a broad tour d'horizon, the study of *The Evolution of International Technology* does not address the legislative aspect in the United States, except to acknowledge in passing that, "The political role of the farmer and the response of the Congress to the needs of the farmer appear to have been affected by the technological revolution in agriculture. . . . Much of the legislation between 1800 and 1900 had a rural or agricultural bias, including the Northwest Ordinance, creation of the Department of Agriculture, the land grant colleges, the Homestead Act, railroad land grants and subsidies, the Interstate Commerce Commission, and sustained support for agricultural research." [131]

For the sake of perspective, however, it should be noted that Congress has played a significant part in giving shape and direction to the technological leadership exercised by the United States since World War II. The Marshall Plan, technical assistance to developing nations, establishment of the Atomic Energy Commission and subsequent support of European nuclear power activities, the space program (including the creation of related organizational structures in the executive branch and in the Congress itself) in response to the challenge of Sputnik I, the development of the Polaris system—these are only a few of the American undertakings combining technology and diplomacy in which Congress has been involved, and in some of which it has at times played the leading U.S. role. It is not the purpose here to catalog such congressional involvements; a number of them are explored in some detail in the other studies of the Science, Technology, and American Diplomacy series.

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[129] *Ibid.*
[130] *Ibid.*
[131] *Ibid.*, p. 32.

Status of the Issue; Prospects and Options

Some of the main points made in the study, as of December 1970, under the heading of "The Emerging Policy Issues of International Technology," deal with effects of technology as the dominant factor of change that has shaped the modern world; these are shown to be both beneficial and injurious. The point has been made that technology is the most obvious avenue to national strength and international influence. "Technology has also been shown to be a potent force, linking the world together by many threads. Technology itself has an evident propensity to 'go global'." [132]

The United States, by virtue of tremendous vigor and public expenditure in the decades of the 1950s and 1960s, enjoys a commanding technological lead among the nations of the world. As Herman Pollack has said: "The attraction generated by this preeminence among the nations of the world, especially those in the process of development, is perhaps one of the lesser understood but more pervasively powerful forces at work in international relationships today." [133]

But will the United States adopt wise and imaginative policies to turn its technological tour de force into permanent gains for humanity?—"The emerging question posed by the onrush of technology, and its effect on the relations among the countries of the world, is whether this potent factor of change and national power is to operate in a random way, or whether it is possible, and desirable, to devise a national strategy to guide and direct it, to stimulate innovation in some directions, and possibly to slow and inhibit innovation in others." [134]

In the July 1970 issue of *Science*, Prof. Robert Gilpin of Princeton identified three major interrelated economic consequences of modern technology: increased interdependence among national economies, the growing role of technological innovation in economic growth and competition, and the rapid spread of multinational corporations, primarily dominated by American capital. He suggested that a "new international economy" was developing under the stimulus of technology, and that there were three alternative national strategies in response to the development: (1) "to support scientific and technological development across the broadest front possible"; (2) scientific and technological specialization; and (3) the importation of foreign technology.

> The United States and the Soviet Union [wrote Gilpin] have followed the first strategy; Sweden, Great Britain, and a number of other countries have followed the second; while Japan and West Germany have, in general, followed the third. Although the U.S. strategy has been relatively successful, particularly

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[132] *Ibid.*, p. [illegible].
[133] *Ibid.*
[134] *Ibid.*

in fields of high technology like space and the computer, it has begun to show defects, and, in Gilpin's opinion, "the direction of America's technological strategy will become an increasingly important political issue." [135]

Gilpin argued that, first of all, "even America does not have the economic and technical resources to support all projects of importance; it too must choose. Second, a high proportion of the limited resources has gone into military and military-related projects, while pressing social and economic ideas of the society have been neglected. Third, the devasting consequence of technological advance for the environment has suddenly emerged as a major national concern. . . ." [136]

Accordingly, the study suggests, "thought might be given . . . 'to the formulation of a more explicit technological strategy designed to increase the social return of its immense investment in science and technology and to minimize its negative environmental effects.' Gilpin concludes with a prediction that":

> . . . To a degree perhaps unparalleled in the past, economic and technological considerations will shape the ways in which political interests and conflicts seek their expression and work themselves out. In a world where nuclear weaponry has inhibited the use of military power and where social and economic demands play an inordinate role in political life, the choice, success, or failure of a nation's technological strategy will influence in large measure its place in the international pecking order and its capacity to solve its domestic problems.[137]

The study observes that the great efforts of the United States in science and technology—since 1940, at least—were inspired by external events. The Manhattan Project was initiated out of fear that Nazi Germany might achieve nuclear weapons first. Work on the H-bomb was impelled by the conviction that it was necessary to beat the Russians to it. The Polaris ballistic-missile submarine was a response to the Soviet missile threat. The whole first decade of the space race was an effort to catch up with and pass the Soviets in a strategically and psychologically important area in which they had assumed a lead. "The great technological programs supported by the United States are still in military, atomic, and space developments, and all are motivated by events outside the United States or else support for them wanes." [138]

Indeed, it is no secret that many U.S. domestic programs owe a substantial measure of their support to the circumstance that they can be tied to the coattails of programs related to military security. Professor Harvey Brooks of Harvard declares that national defense is too often used as justification for doing what is needed simply for the good of American society. For example:

> We backed into Federal support of higher education while stoutly insisting that we were only buying necessary military research results. We entered upon school curriculum reform, long overdue, on the grounds that it was needed to make our engineers and scientists better than their Soviet counterparts. We launched a gigantic interstate highway program on the grounds that it was needed for national defense. We fostered the study of international affairs and the development of foreign area research on the grounds that a great power needed this knowledge to maintain its power position.[139]

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[135] *Ibid.*, p. 66.
[136] *Ibid.*
[137] *Ibid.*
[138] *Ibid.*, pp. 66–67.
[139] *Ibid.*, p. 67.

It seems paradoxical, concludes the study, that the United States—best equipped to apply science and technology to the solution of the world's problems, and credited with the highest development of managerial skills—"has been reluctant to devise and implement a positive technological strategy of its own. There would seem to be no lack of opportunities: earth resources satellites, ocean and ocean floor development, urban improvement, recovery of resources from all forms of waste, the Oak Ridge proposal for large agricultural-industrial-nuclear complexes, and many more." [140]

Author's Reassessment in 1975

Technology is perhaps the most powerful of all forces for change in the modern world. It measures the qualification of nations for leadership in the community of nations. It affords a means for the achievement of a nation's domestic and foreign goals. It is a principal substance of modern diplomacy. A nation's diplomatic voice is often heard in proportion to the nation's excellence in science and technology, and in its competence to use these for national and international purposes.

In this chronologically first substantive study of the Science, Technology, and American Diplomacy series, the research drew mainly on historical sources. Most of the eleven studies that followed it provided evidence that the theme and findings of this study were altogether valid. The impact of the energy crisis, the demands by developing countries for technical assistance, and the directions recently taken by bilateral and multilateral programs, are some additional contemporary evidences of their validity.

The emphasis of the study was on the roles and impacts of technology on the world scene. Attention might usefully have been given also to the ranges of problems created by these developments for U.S. and foreign diplomats and for the U.S. Congress. The study demonstrated beyond cavil the diplomatic significance of technology. But the relevance of the study would have been more incisive if the diplomatic issues related to main technological trends had been explicitly stated. This was done in later studies in the series with narrower scope, and most strongly of all in the concluding substantive study, *Science and Technology in the Department of State.*

There are two aspects to the question of legislative relevance: the actual relevance of the subject of international technology for the Congress, and its perceived relevance as demonstrated by congressional action. The variety of problems of diplomacy with substantial technological content is large, and growing. Accordingly, the subject is increasingly more relevant for the Congress. However, the complexity of the problems presented, and the want of means for rendering them coherent and manageable, stand in the way of congressional action.

At the outset of the project the decision was made, as to its scope, to encompass both science and technology in their relation to diplomacy. It soon became evident that science and technology had different kinds of impacts on diplomacy. In starting out with an examination of the technological impacts on diplomacy, we saw that these were direct and powerful; moreover, we observed also that the main impacts of science on diplomacy tended to be indirect—through the medium of technology that grew out of the science. It also became evident that in the early efforts to relate science and technology programatically to diplomacy the emphasis was on science and the leadership was provided by the scientific community. Science had the prestige and the intellectual attractions. However, with the passage of time it has become apparent that functionally technology has the greater direct impact and requires more attention of diplomatic analysts. Now there are some persons who even contend that science should not be separated from technology in the diplomatic environment lest science drop out of the orbit.

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[140] *Ibid.*

The study emphasized the changes in the effects of technology on U.S. diplomacy over the past several decades. These changes were in terms of pace, size, complexity, variety or scope, and range and pervasiveness of impacts. In more general terms:

> A nation that consciously and dynamically lays the groundwork for technological advance, encourages technological skills, rewards innovation, and systematically increases the variety, depth, sophistication, and universality of its technology, is in a stronger bargaining position than a nation that does not. Technology increases the range of [diplomatic] options. . . .

Technology was seen to be a "primary source of national power and diplomatic influence," but at the same time the quest for such power and influence led to the internationalization of technology. Thus:

> . . . As each technology evolved it became internationalized, its substance became the subject of international conversations, its effects extended beyond national boundaries, and [the study foresaw as an ultimate outcome] the evolution of a global system incorporating or resolving the technology.

Recent examples of this process are to be found in the production, distribution, and use of energy fuels and industrial materials. At the third Henniker Conference on National Materials Policy a major theme to emerge was that modern nations are "condemned to interdependence."

Three trends were observed in the global sweep of technology: (1) The important ways in which evolving technologies added to the problems and issues confronting the diplomat (as was made abundantly evident later in the study *Science and Technology in the Department of State*); (2) the ways in which technology tended to draw nations together in international enterprises (as demonstrated in the studies of world food/population balance, global health, the Mekong project, and commercial uses of atomic energy, for example); and (3) the emergence of many positive values and serious dangers of technology that were of concern to many nations (and here the evidence is overwhelming: SALT talks, the Stockholm conference on the environment, the special session of the U.N. General Assembly on materials, various meetings on food and population, energy and so on). These trends evidence a growing need for explicit plans to manage technology to produce global results compatible with U.S. foreign policy. (Although on this last point the *need* was abundantly documented throughout the series, and especially in *Science and Technology in the Department of State*, the performance and the institutional provisions to meet the need were, in general, not considered adequate.)

An interesting contemporary example of both the importance and the ambivalence of technological impact on diplomacy is the reception by the "Third World" of the U.S. plan for earth resources satellite surveys. These were recognized as beneficial in the discovery and inventorying of resources but denounced as an invasion of sovereignty and a means by which rich nations would be enabled to plunder the minerals of the poor countries.

One conclusion of considerable importance was neglected in this study: that the kinds of impacts of a given technology and the rate at which they occur are susceptible of analysis leading to prediction. The study of diplomatic consequences of a technology is accordingly a vital activity. The impacts are reasonably foreseeable, and the necessary diplomatic responses can likewise be defined in advance with careful study. But they seldom are. With the benefit of hindsight, this neglected area of diplomatic planning was later discussed in *Science and Technology in the Department of State.*

The purpose of this initial study was to define and explore the universe of technology as related to diplomacy. The principal issue it raised that might have taken legislative form concerned the relative utility for U.S. diplomacy of bilateral versus multilateral programs. This issue runs as a theme throughout many of the subsequent studies. However, the question persists and the need for its examination as a policy issue is greater than ever. The space program is the subject of some 250 bilateral agreements. Bilateral science agreements number another 50 or so. Atomic energy bilaterals are continuing to proliferate. Precisely how these are coordinated for foreign policy purposes, and how they relate to multilateral objectives and programs, is a continuing perplexity.

Both for the 1970s and for the rest of the present century, the issue of global management of technology is likely to remain a foremost concern of U.S. diplomacy.

Some Illustrative Questions

What are the U.S. diplomatic goals that are served, or contravened, by the international spread of technology and its impacts?

How do U.S. diplomatic goals that involve technology relate to those of other nations?

What mechanisms or institutions are there, or might there be, to reconcile U.S. and foreign diplomatic goals respecting technology?

How is U.S. diplomatic planning conducted with reference to the uses and concerns of technology?

What is the present balance in the U.S. Government's effort as between maintenance of deterrent force and emphasis on technological programs serving constructive peaceful purposes? What balances of this sort are observable in other nations? Could the uses of peaceful technology be further extended for diplomatic purposes?

What domestic developments in technology might be encouraged in support of U.S. diplomatic goals?

How far into the future is it possible to project analyses of technological change, and with what degree of probability?

How does technological analysis compare with economic analysis and political analysis as to predictive power?

ISSUE TWO—THE POLITICS OF GLOBAL HEALTH[141]

Statement of the Issue

For more than a century the health of the peoples of the world has been a subject of international concern and action, enlisting the combined efforts of diplomacy and science. However, public awareness and public investment have not been commensurate with the health benefits of global action. The author, Dr. Freeman H. Quimby, puts the central question in his introduction to the study: Why has a matter so important to all mankind—human health and disease prevention—not become a more effective, comprehensive, and dynamic focus of international cooperation? [142]

Importance of the Issue

Disease is international; it moves freely across political boundaries. Preventive medicine, also inherently international, requires continuing vigilance and international cooperation on the part of scientists, diplomats, national and local political leaders, and the public. Pockets of infectious and communicable disease exist all over the world, in less developed countries and even in those most advanced. Under conditions of social disruption, floods, hurricanes, and other natural disasters, these cells of infection can burst forth as world epidemics. Conversely, by a relatively modest investment in each case, they can be eradicated or controlled. Yet, half of the world's people have no access to health care at all; millions die each year of readily preventable sicknesses. There is even some retrogression as the effects of urban blight strike the slum poor in the midst of affluence. Against this dismal picture of underachievement must be seen a great and growing array of unused and underused technical capabilities for controlling disease and building health. The issue is how to, advance world health through programs utilizing these capabilities supported by the combined efforts of diplomats, scientists, and the public.

In the context of the Science, Technology, and American Diplomacy study series, the issue is illustrative in several special ways:

(1) It demonstrates that general acceptance of the importance of an issue, and of the desirability of taking measures to cope with it, does not insure full implementation of appropriate measures. The problem differs in intensity from that of the brain drain,[143] in which a persistent issue that lacked comparable popular appeal and dynamism surfaced from time to time only to drop out of sight again, still unresolved. The issue of global health, affecting the lives and well-being of people everywhere, commands continuing support from the world's governments. This support, however, does not extend beyond halfway or palliative measures to stout and forceful programs and toward rational goals of achievable global health.

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[141] U.S. Congress, House, Committee on Foreign Affairs, *The Politics of Global Health*, a study in the series on Science, Technology, and American Diplomacy, prepared for the Subcommittee on National Security Policy and Scientific Developments by Freeman H. Quimby, Science Policy Research Division, Congressional Research Service, Library of Congress, Washington, U.S. Government Printing Office, 1971, 79 pages. (Committee print.)

[142] *Ibid.*, p. 1.

[143] For a full treatment of this subject, see: U.S. Congress, House, Committee on Foreign Affairs, *Brain Drain: A Study of the Persistent Issue of International Scientific Mobility*, in the series Science, Technology, and American Diplomacy, prepared for the Subcommittee on National Security Policy and Scientific Developments by Dr. Joseph G. Whelan, Senior Specialist in International Affairs, Foreign Affairs Division, Congressional Research Service, Library of Congress, 1974, 272 p. (Committee print.)

(2) The issue also provides instructive examples of progress attributable to the teaming of scientists and diplomats in extended negotiations. When the French Government convened the first international quarantine congress in 1851, each of the 12 participating nations was represented by a medical doctor and a diplomatist. Delegates were left free to vote individually. Although in voting the two groups tended to cancel each other out, with resultant tensions and frustrations, the diplomats and doctors were at last able to agree to 137 articles on international sanitary regulations. The pattern of one diplomat and one doctor from each country continued during 10 international sanitary conferences which followed between 1851 and the end of the century.

(3) The same example illustrates another point: the essentiality of sustained application of diplomacy among countries as well as in relations between scientists and diplomats. The pairing arrangement would probably have been fruitless if not held to doggedly until the job was done; failure might have discouraged further efforts for years to follow. Adoption of the first international rules required 48 plenary sessions and 6 months of work. What is more important, for the first time diplomats and doctors from leading nations had met in earnest to discuss common global disease problems. (It was the diplomats rather than the scientists in this instance, in contrast to that of the International Geophysical Year,[144] which made the undertaking a success. The scientific community of the time was divided between the sanitarians and the quarantinists. Today, both views are recognized as separately inadequate but complementary elements of a comprehensive approach to the problem. Arguments over rival scientific theories consumed most of the time of the conference, but the French diplomatic representative who chaired it continued to seek workable solutions, and the diplomats as a group appeared to have had instructions not to yield to either of the extreme scientific positions. The result was successful compromise.)

How the Issue Developed

Historically, cycles of pestilence were accepted as a fact of life. There was a series of disease invasions of Europe beginning with the Christian era, running on through the fall of Rome, and climaxing in the black death of the 14th century. (They did not end there: the influenza epidemic of 1918–19 took 20 million lives.) In time, the attitude of acceptance yielded to an active search for causes and remedies.

BEGINNING OF PREVENTIVE MEDICINE

Preventive medicine began, at least in England, with public demand for corrective measures against recurring epidemics based on the observed association between polluted water and disease. Its first phase, including some aspects of sanitary engineering and public hygiene, was marked by legislative acts like the Great Reform bill of 1832, the Metropolis Water Act of 1852, and the Public Health Act of 1875.

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[144] See: U.S. Congress, House, Committee on Foreign Affairs, *The Political Legacy of the International Geophysical Year*, in the series Science, Technology, and American Diplomacy, prepared for the Subcommittee on National Security Policy and Scientific Developments by Harold Bullis, Analyst in Science and Technology, Science Policy Research Division, Congressional Research Service, 1973, 64 p. (Committee print.)

The scientific or experimental phase of preventive medicine—the era of bacteriology—overlapped and followed the sanitation movement. It provided the technical foundation on which sanitary water and sewage disposal practices are still based, as well as for coping with those infectious diseases which can be controlled or eradicated by vaccination.

Though all nations benefit from the health of their own citizens and those of other nations, and health measures are generally accepted throughout the world, present levels of international cooperation in public health were not easily achieved and remain hard to sustain or extend. In the early deliberations (1850–1900) the paucity and uncertain authority of scientific knowledge left much room for debate and for the convenient alignment of medical science with national interest. Thus, the German members of the International Sanitary Council of Constantinople made decisions of little consequence to disease but calculated to expand the political dominance of Germany or to weaken British commercial dominance; British physicians, even with French scientists ridiculing their logic, supported British shipping interests by downgrading the importance of quarantine restrictions; Turkey reportedly paid little attention to sanitary rules, holding that the whole system was a tool of imperialist power politics rather than one designed to protect Europe from invasions of epidemics.[144]

EARLY INTERNATIONAL EFFORTS TO CONTROL DISEASE

It is to the credit of diplomacy that under these circumstances nations persisted in developing constructive plans and international rules for controlling the spread of disease. It was a long step forward when the French Government convened the first International Quarantine Congress in 1851. Successive congresses were held in Constantinople in 1866, Vienna in 1874, Washington in 1881, Rome in 1885, and Venice in 1892. Three other agreements dealing with cholera which followed in 1893, 1894, and 1897 were later combined in a single International Sanitary Convention in 1903. In 1909, as a result of a 1907 meeting in Rome of 12 nations including the United States, a permanent International Office of Public Hygiene was set up in Paris. It continued to function through both World War I and World War II, after which it was absorbed into the World Health Organization (WHO), created in 1946.

The first full-fledged international health organization, in the sense of one which carried out sanitary policing action, was the Pan American Sanitary Bureau (PASB), established in Mexico City in 1902. Further strengthened in 1924 when 24 nations of the Americas ratified the Pan American Sanitary Code, the Bureau provided for regional cooperation in public health which went beyond existing European practices. Now known as the Pan American Health Organization or PAHO, it still exists as an autonomous international health organization for the Americas; it serves additionally as the WHO regional office. It brought extensive experience in the control of disease to the process of designing the new WHO. It also played a strong role in the adoption of a decentralized structure for WHO, which (with its six regional offices) is unique among the specialized agencies of the United Nations.

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[144] Many similar examples could be cited. In 1898, for example, German provincial inspections for trichinosis were designed as much to keep out American pork as to protect local populations. (See Huddle, *Science and Technology in the Department of State*, p. 52.)

There was another major development in international health organization before World War II. The League of Nations set up an International Epidemic Commission in 1920; this was succeeded by a health organization in 1923. The latter was a success despite feeble financial support from member governments (it had substantial assistance from the Rockefeller Foundation); it soon outstripped the Paris office in both importance and influence.

The League of Nations Health Organization expanded to a new order of magnitude both the pattern of large-scale cooperative effort through international organizations in general and the dissemination of public health knowledge and skills in particular. It stimulated quarantine reform and quelled numerous epidemics; sought to standardize serums and vaccines; set up epidemiological centers in Geneva, Singapore, and Melbourne; established international study tours, lectureships, and a public health library; published monographs; placed its experts at the disposal of governments; and brought together public health officials from many countries to coordinate their efforts. Thus, when the World Health Organization was born, it began not as a revolutionary experiment in public health but as the sophisticated heir to the work of the League Health Organization and its predecessors.

ESTABLISHMENT OF WORLD HEALTH ORGANIZATION

The World Health Organization was formed in July 1946 within the terms of the United Nations Charter. (The United States, which had not belonged to the League of Nations or its Health Organization, became a member of WHO in June 1948.) The WHO constitution cites a single objective: "The attainment by all peoples of the highest possible level of health." Health is defined by WHO as ". . . a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity."

The WHO constitution specifies 22 functions for the organization, ranging from the broad mandate to "act as the directing and coordinating authority on international health work" through "assist governments, upon request, in strengthening health services," "establish and maintain such administrative and technical services as may be required, including epidemiological and statistical services," "promote and conduct research in the field of health," and "assist in developing an informed public opinion among all peoples on matters of health," to "take all necessary action to attain the objective of the Organization."

These high aims and the need to resume work interrupted by the war, as well as to deal with conditions caused by it, gave WHO an early momentum. It has since grown into an international operation of considerable size and significance. At the time of this study (1971), its regular budget, funded by assessed contributions from member governments, had risen from an initial $5 million to $73 million—that of WHO and PAHO together to above $100 million. (The latter figure had grown to more than $150 million by 1975.) It had (and still has) regional offices and committees in Copenhagen, Alexandria, Brazzaville, Manila, New Delhi, and Washington, in addition to its headquarters in Geneva. It had a total staff on the order of 4,500—about a fourth at headquarters, the remainder at regional and zone offices and in 131 (now 145) member countries. It maintained hundreds of laboratories and reference centers or collaborating institutes all over the world, had formal working relationships with some 82 major international government and nongovernment organizations in the health field, and was supported by numerous advisory panels and expert committees in virtually every health or health-related subject area. It initiated annually thousands of research grants and training fellowships. It administered the international health regulations adopted by the World Health Assembly in 1969, and under the regulations operated a global intelligence network on the principal epidemic diseases of the world. Finally, it was a major publisher of biomedical literature: Its monographs and technical reports often represented, in effect, a world consensus of experts in various health subject areas. (All of these activities are expanding.)

STATUS AND POTENTIAL OF W.H.O. TODAY

Despite this impressive growth, WHO today is far from translating into global accomplishment such principles, enunciated in its constitution, as "The health of all peoples is fundamental to the attainment of peace and security. . . ." and "unequal development in different countries in the promotion of health and control of disease . . . is a common danger." The failure to meet the implications of these declarations has been generally attributed to budgetary realities. Even if the major nations fully appreciated the diplomatic potential of public health and modern medicine as a vehicle of international good will, it is not likely that they would approve a budget or a philosophy which would look to the World Health Organization for the solution of all global health problems. With a budget less than one-tenth that of the New York City Health Department,[146] WHO concentrates its resources on advisory and coordinating activities and on major disease control and eradication programs. Undeniably, a greater degree of U.S. involvement and contribution of funds in excess of its annual assessment would improve the rate of success in the control of malaria, cholera, and other infectious diseases, but the monetary exchange rate is currently a greater problem for WHO than is the U.S. attitude toward international organizations.

Larger U.S. and other member commitments to WHO would indeed make it possible for improved followup on its projects and programs; disease eradication or control programs could be intensified and studies of health care systems and of health manpower coordination could be expanded.

But WHO was not intended to be a world medical society to provide global health services to developed and developing countries. Its services and technical assistance are rendered in response to specific requests from member governments. It is the demand and the legitimate need for technical assistance, and the ability of the requesting country to use it, which should largely determine the size of WHO's budget. Dr. Quimby's study suggested that WHO's budgetary restraints necessitated the setting of a few high-priority programs, and that there would still be numerous countries in desperate need of advice and assistance because of degrading health conditions.

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[146] Kevin Cahill. *The Untapped Resource: Medicine and Diplomacy*. Orbis Books, Maryknoll, New York, 1971: p. 7.

A further perspective on WHO's failure to realize its full potential may be found in the author's concluding comment:

> Public health on a worldwide scale has yet to command the attention of governments which a global perspective of health would appear to require. The nature of the work is undramatic; the subject offers little in the way of political capital as do so many other medical topics. Disciplinary development and professional status for public health and preventive medicine are low compared with those of modern diagnostic and curative medicine in the United States and other developed countries. The public and its elected representatives may not be aware of the miracles which have been achieved in the field of preventive medicine; it was these, rather than the glamorous surgical and pharmaceutical inventions of recent vintage, which so dramatically changed the life expectancy of man. The world was made a relatively safe place in which to live and travel many years ago by the application of what now appear to be rather simple biological, medical, and engineering facts. Indeed, the techniques of preventive medicine have been so successful in developed lands that neither crisis nor controversy worthy of intensive political attention has emerged in recent years.
>
> In the less-developed lands, the power to improve human health at least cost still lies in the application of proven technology in the public health and sanitation field. Curative medicine in the poor countries has as much appeal as it does in advanced countries with large populations of people with various forms of degenerative disease, but there are lacking the medicines, the doctors, and the places in which to apply the cures. In many of these developing areas, the services of sanitary engineer, hydrologist, or geologist are more essential to permanent health gains than is the increased availability of doctors and clinics. Plant geneticists and agrarian reform, together with culturally adapted population policies, will contribute more at this time to a revolution in the health of some of the economically depressed countries than will the importation of modern technology.[147]

U.S. Involvement

The United States has played an active, if not necessarily a leading, part in many of the international health initiatives of the 19th and 20th centuries. U.S. financial support of the World Health Organization since its inception has been steady, and has far exceeded that of any other country. (The U.S. assessment ranged from about $6 million or 31.7 percent of the WHO assessed budget of about $20 million in 1961 to roughly $23.65 million or 30.87 percent of the WHO total assessed budget of more than $73 million in 1971. In 1975 the U.S. assessment for WHO was $30.15 million, or 25.64 percent of the WHO total assessed budget of $115.4 million.) On the other hand, U.S. support from the beginning has been less than all-out; the United States has rarely voted for approval of the WHO budget, and in recent years has worked with the other major contributing states to reduce it. The United States has a respectable record of faithful payment of its WHO assessments and good performance in voluntary contributions to international health activities in general. Nevertheless, restraining factors over and above normal budgetary prudence appear to have been well entrenched.

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[147] Quimby, *The Politics of Global Health*, p. 73.

POSSIBLE REASONS FOR EARLY U.S. DELAY IN SUPPORTING W.H.O.

For example, the 2-year delay of the United States in ratifying the constitution of WHO seems to have been motivated by both medical-political and national-political considerations, including fears that WHO would become involved in such questions as health insurance and socialized medicine in an international context rather than the problems of preventive medicine on an international scale. Another factor making for confusion of goals at the outset may have been that the American leaders involved in the planning of WHO were more likely to have been specialists in preventive medicine or public health than experts in curative medicine with individual patient orientation. They were supported by diplomats whose thinking was conditioned by the past dominance of public health (preventive medicine) over private health (curative medicine) philosophies in most of the countries of the world. It is the curative medicine school of thought that has dominated the power structure of American medical practice, and that is the more vocal and organized in exerting pressures on the decisonmaking processes of the U.S. Government. Another pervasive factor has been the U.S. preference for bilateral programs, over which it could exercise more direct control, as against multilateral activities, which many U.S. leaders have tended to regard as inefficient if not misdirected.

Since World War II the United States has conducted a wide range of bilateral programs in the international health field, some with further multilateral ties and some independent. The major U.S. Government departments supporting programs of research, technical assistance, or economic aid in health and related subjects overseas have been the Departments of State, HEW, and Defense.

U.S. GOVERNMENT ORGANIZATION FOR INTERNATIONAL HEALTH AFFAIRS

The two principal organizations in the Department of State with responsibilities for international health affairs are the Bureau of International Organization Affairs (IO) and the Agency for International Development (AID). The former administers the U.S. contributions to international and Inter-American organizations—mainly WHO and PAHO—and to certain special programs; they are discussed further below under *Role of Congress.* AID administers the bulk of U.S. bilateral technical and economic assistance, including health and sanitation projects, and makes voluntary contributions to multilateral organizations like the United Nations Development Program. One of the largest health programs supported by AID has involved community water supply development and management of sewerage and waste disposal systems to lessen the danger of diseases caused by pollution. By 1971 AID had established unique guidelines and machinery for both operations and research in international health work, such as the control and eradication of epidemic and endemic diseases. Although funds available for such operations had been decreasing year by year, there was a turnabout in 1972; by 1975

AID had a budget of about $90 million for international health, of which nearly a third consisted of funds for capital investments in sanitary sewerage and water supply. Earlier limitations of AID as an organization serving U.S. interests in international health were lack of staff in the medical field and its practice of concentrating assistance in relatively few countries. In the fiscal year 1969, 87 percent of AID's assistance to individual countries went to only 15 nations. Today, however, AID provides health assistance to 30 nations and cooperates actively with WHO—not only with its Geneva headquarters but with its various regional offices. Indeed, the multilateral programs of WHO and the bilateral programs of AID are now the mainstay of global health activities involving the United States. Both programs are increasing in total funds and in scope. Furthermore, coordination between WHO and AID is today much greater than in the past. Each knows what the other is doing, and programs are coordinated.

THE ROLE OF DHEW

The Public Health Service (PHS) in the Department of Health, Education, and Welfare is the primary U.S. Government resource in both national and international health. It is the official technical liaison with WHO and PAHO. Its chief medical officer played a major role in the drafting of the WHO's constitution and has usually served as head of the U.S. delegation to the World Health Assembly. PHS prepares the U.S. technical position papers for the assembly and provides or assists in providing experts for the WHO advisory committees.

Many of HEW's laboratories and institutes serve as WHO reference centers or collaborating research institutes. There are many such centers and institutes in the United States; several of them are located in the PHS National Center for Disease Control in Atlanta, Ga., which is part of WHO's worldwide epidemiological intelligence network. Besides playing a prominent role in international health organizations, HEW participates actively in U.S. bilateral health and sanitation programs.

The National Institutes of Health of the Public Health Service (NIH) no longer maintains overseas offices in U.S. Embassies in Paris, Rio de Janeiro, Tokyo, or New Delhi. It continues, however, to support research laboratories in the Panama Canal Zone (the Middle America Research Unit and the Gorgas Memorial Laboratory), Puerto Rico (Laboratory of Perinatal Diseases), and Guam (Epidemiology and Genetics Centers). NIH also administers the Pakistan Cholera Research Laboratory for SEATO, funded under a bilateral agreement between AID and the Government of Bangladesh.

HEW's international health activities, like those of all Federal agencies except AID, have been in decline in recent years. The activities and budgets of WHO and PAHO, on the other hand, have expanded somewhat each year. Despite U.S. resistance to increasing assessment, the United States has continued to meet its treaty commitments to these international organizations and to facilitate certain of their efforts through special voluntary contributions.

THE DOD ROLE IN INTERNATIONAL HEALTH

The Department of Defense (DOD) plays a special part in the international health field. Military medicine has long been the backbone of tropical and preventive medicine. The improvement in military medical organization from the Civil War on, the ability of the services to attract competent researchers and practitioners, and the mobility of the Armed Forces, have made it possible for military medicine to contribute to the remarkable progress of American medicine as a whole and especially to the solution of global health problems. American military medicine has produced one of the best medical libraries in the world, and among the medical disciplines it ranks high in the fields of pathology and epidemiology. DOD supports a substantial amount of research in foreign countries and maintains four overseas offices in developed nations, mainly for research and development liaison purposes. Experienced observers have noted that with the end of colonial administrations and their health services in many of the less-developed countries, U.S. military medicine has helped to fill the gap, especially by providing a pattern for American industry to follow.

With the decline in teaching of tropical medicine in U.S. medical schools a physician must look either to military service or to experience in one of the international health programs to learn how to deal with malaria and other endemic tropical diseases.

Despite all this U.S. activity in the international health field, what seems to stand out in overview is a reluctance to become any more involved than is required by the tacit dictates of conscience, humanitarian impulse, and characteristic American pragmatism. Forthright considerations of moral leadership, on the one hand, or of political gains to be had in pressing U.S. technical and economic advantages, on the other, do not appear to have been consequential factors.

Role of Congress

Early congressional actions with respect to WHO were not enthusiastic. Congress was slow to ratify the WHO constitution and then arbitrarily set the annual U.S. contribution at $1.9 million, meanwhile appropriating tens of millions for short-term bilateral health aid. In general, extensive hearings records examined during the preparation of this study showed a strong congressional preference for bilateral programs. Three major studies of aid and development, available at the time, were of little use in focusing the attention of Congress on the extent to which poor health impedes the social and economic progress of mankind, or in presenting a realistic and balanced picture of both the problems facing international organizations like WHO and the great potential of adequately supported health organizations for providing cost-effective solutions to many of these problems. These three studies were:

One: The 400-page Pearson Report of September 15, 1969 (report of the Commission on International Development set up by World Bank President Robert S. McNamara), which dismissed international health problems in two pages but conveyed the impression of sweeping advances and credited WHO with achievements that that Agency would not itself claim—prompting the *New England Journal of Medicine* to comment: "The cursory and grossly inaccurate treatment afforded health is representative of current economic thought."

Two: The Jackson Report of September 30, 1969 ("A Study of the Capacity of the United Nations Development System," published by the United Nations), which appeared to deemphasize WHO in favor of a reorganized U.N. development program as the focal point of funds, coordination, review, and decision in technical assistance for country-centered health programs, and—even though such an approach could not have been put into practice for several years—suggested to U.N. member governments that they could stabilize the WHO budget at the level already achieved.

Three: The Peterson Report of March 4, 1970 (Report to the President from the Task Force on International Development), which proposed to rely on multilateral organizations like WHO in place of AID, but included no specific recommendation that AID funds for health and sanitation be transferred to WHO. Indeed, it did not even mention WHO directly, and rarely mentioned health.

INADEQUATE BUDGET JUSTIFICATION FOR U.S.' SHARE OF W.H.O.' FUNDING SUPPORT

Nor does the method by which the executive branch presents its budget justification for the U.S. share of funding support for WHO and PAHO provide Congress with a clear and emphatic picture of the needs of these organizations in relation to potential for accomplishment. This justification is submitted to the House and Senate Appropriations Committees (the respective Subcommittees on State, Justice, Commerce, and the Judiciary) as part of a total package that includes the United Nations and its nine specialized agencies—of which WHO is one; the package also includes PAHO and five other inter-American organizations, NATO and 6 other regional organizations, and 15 miscellaneous bodies. Related hearings records typically do not deal with the nature and merit of the substantive work of agencies like WHO and PAHO; attention is largely focused on budgets and balance of payments. The prevailing view seems to be that the United States is overassessed and overcommitted to ever-increasing organizational budgets; assessments for multilateral enterprises are seen as one more form of foreign aid. Not only has international health not been spared from rising congressional concern about costs, lack of control over budgets, and the need to restrict the outflow of American dollars: on the contrary, international health organizations—as modest as their demands are in comparison with nuclear power and weapons donations, and in relation to possible returns—have often been singled out for budgetary discussion in both Senate and House appropriations hearings.

LACK OF UNDERSTANDING OF MULTILATERAL HEALTH PROGRAMS

Congressional frugality with respect to multilateral health programs would seem to reflect in large part a communications gap—that is, a lack of understanding of how much international health activities have accomplished and also how much remains to be done that cannot effectively be done through bilateral measures—and the absence of a sense of urgency. Symptomatic of the latter was the failure of a bill (H.R. 12453, the International Health Act of 1966) aimed at the shortage of manpower trained for international health activities and at raising the low level of U.S. participation in the WHO staff. The bill was supported by the HEW Secretary, the Surgeon General, the American Public Health Association, the Association of American

Medical Colleges, and the American Medical Association. During hearings on the bill in February 1966, there was excellent dialog among the members of the Committee on Interstate and Foreign Commerce and the expert witnesses. WHO and PAHO were mentioned repeatedly during the hearings, as was the fact that international health problems require a different kind of instruction from that available in the typical American medical school. It was pointed out that there were only three medical schools in the United States with associated schools of public health. In spite of these endorsements and the acknowledged need to correct a defect in American medical education, the legislation was not passed, failing to get out of the Rules Committee. This inaction may be attributable to the low priority attached to the measure, inasmuch as no opposition was recorded. No subsequent legislation has been introduced specifically for the training of international health specialists. However, because of demand, several new schools or departments of public health have been established in American medical schools, without specific Federal legislation.

Status of the Issue

WHO has accomplished much in spite of lackluster moral support and indifferent understanding on the part of the United States as its major financial contributor. That it has done so must be attributed in large degree not only to the inherently constructive nature of health services—although this character may have insured WHO's survival, it does not account for its signal success—but rather to the sustained diplomatic skill and perseverance of its leadership.

Able leadership has been evident in WHO from the beginning. Whereas the drafters of the WHO constitution gave it powers over functions which governments normally reserve to themselves, the authority of WHO has never been fully exercised by its administrators. Prudent men have used both commonsense and caution in applying the constitutional provisions. As a result, WHO has been able to function effectively even in the presence of unresolved political problems. It has refused to deal with some problems because they were predominantly political, but worked out solutions to others—where necessary to organizational progress—by avoiding legalistic debates and pursuing a pragmatic and realistic course. Thus U.S. insistence upon reservations as conditions of acceptance of the WHO constitution was ignored as an obstacle, even though there was no provision in the WHO constitution for reservations: the Assembly accepted the United States with full rights and refused to permit such conditions on membership to become an issue for the future. Then, in 1949 and 1950, when nine Communist member countries withdrew over alleged failure of WHO to execute agreed programs, the break was viewed as temporary. Withdrawing members were asked to reconsider, and by preparing the way for a settlement of assessments in arrears, WHO brought about their return after a few years.[148]

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[148] A still more difficult situation involved the handling of Arab and Israel differences within the WHO framework. The solution was to establish two subcommittees of the Eastern Mediterranean Regional Committee—Subcommittee B for Israel, Subcommittee A for the other States in the region. The subcommittees meet but the Regional Committee as such does not. In that way, until recently, the politicization of WHO on the Arab-Israeli issue was avoided. (It has now occurred—perhaps following the lead of UNESCO, but rather in the nature of a routine annual event insofar as WHO is concerned—in the form of a resolution against Israel for not improving the lot of the refugees, et. cetera.)

WHO has relied less on regulations and more on the authority of international biomedical consensus. This course has proven politically wise in many instances, and an effective strategy: to report conclusions of the world's health experts and to leave implementation to member governments.

Prospects and Options

WHO's power resides largely in the high regard in which it is held among the scientific and public health specialists of the world and its acceptance as the highest forum of world medical opinion. Its limitations lie mainly in budgetary constraints which reflect lack of priority standing with governments and the general public. Public health on a worldwide scale has yet to command the attention which its potential for further progress would warrant. The nature of the work is undramatic; in the United States and other developed countries, disciplinary development and professional status for public health and preventive medicine are low compared with those of modern diagnostic and curative medicine; and the public and its elected representatives are apparently not aware of the miracles which have been achieved in the field of preventive medicine (although the recently publicized example of the People's Republic of China may be working some change in this field). However, there has been an interesting recent development in this area: a 3-day symposium on preventive medicine held at NIH during the summer of 1975.

SEEMING NEED OF STRONGER U.S. SUPPORT OF INTERNATIONAL HEALTH PROGRAMS

Recent trends in international health activities reflects a movement from bilateral to multilateral programs such as those of WHO, PAHO, and UNDP. The Peterson Report, among other studies, recommended this approach. The United States has the resources, the systems skills, and the biomedical technology for greatly assisting WHO to realize its full potential. For this to happen would require stronger support than is now evident and more visibility at policy levels of the Departments of State and HEW, in the Congress, and—ultimately—among the U.S. public at large.

The foregoing assessment suggests the desirability of a national debate on the issue of global health and its interrelationship with national health. Such a debate, involving medical and other scientific and technological, political, and economic circles, would have as its principal aim the education of the American public on a matter of fundamental human concern. The instrument for leading such a debate and educational initiative could appropriately be a committee of the Congress, or perhaps two or three committees in conjunction—one concerned primarily with international relations, another with health, and a third with science and technology.

The study of *The Politics of Global Health* suggests additional needs. In the annual congressional scrutiny of proposed budgets for international health activities, cost-benefit aspects have not been sufficiently examined—probably because of the great range and complexity of the subject matter. A qualified research institution could be enlisted to make a thorough study of the relationship between the actual costs and the direct and indirect benefits of international health programs. Examples are at hand of some successful surveys in specific connections: e.g., the control of poliomyelitis in the U.S.S.R., and the reduction of infant mortality in Yugoslavia. Such a survey should take account not only of past and present experience but also of potential benefits in relation to costs. For example, arrangements for global medical surveillance and early warning of the dangerous spread of disease, together with reliable health statistics, have hardly scratched the surface. The United States would benefit from a WHO evaluation of the various systems of health care now in operation around the world; from a set of WHO standards on electronic medical diagnostic equipment, water and air pollution, and methods in the treatment of alcoholics and heroin addicts; and from such other internationally established standards as WHO–FAO (Food and Agriculture Organization) criteria governing the permissible amounts of heavy metals in foods. Other types of studies for which the United States does not have sufficient affected population samples, but from which much of value to U.S. medical research and the American people could be learned, include studies of the effect of severe malnutrition on early development and learning and perhaps of certain types of cancer and heart disease.

REASONS FOR POSSIBLE SHIFT OF BUDGET DEFENSE ROLE FROM STATE TO DHEW

It might also be appropriate to consider shifting the main burden of budgetary justification for WHO, PAHO, and other international health activities from the Department of State to DHEW. With appropriate State Department coordination but without present constraints on the presentation of substantive accomplishments and needs resulting from the simultaneous consideration of funding for all international organization activities in all fields, DHEW might be expected to serve as a more effective focal point for the technical documentation, planning, review, and analysis of issues in connection with U.S. participation in WHO, PAHO, and certain bilateral biomedical programs. Underlying this proposal is the reasoning that the expansion of national public health interests to global dimensions requires not only conventional diplomacy: It calls also for worldwide experience with science, medicine, and public health as political systems themselves and for experts in the subject matter. To the increasing extent that a worldwide approach is taken to the problems of human health, it will be necessary for knowledge to be shared and exchanged by those who through training and practice are equipped to work with it.

The problems and potential of the State Department for managing U.S. relationships with international activities in general are examined later, in Issue Six. It has been a thesis of the present study that it would be beneficial for the Department of Health, Education, and Welfare to be brought more into the forefront of policy formulation and review, and budget presentation, with respect to U.S. support of international health programs. (See, however, the author's postscript to this comment, immediately following.)

Author's Reassessment in 1975

No changes have occurred in the past 4 years which would modify the conclusions of the study, except in some matters of detail. Author Freeman H. Quimby comments (July 1975) as follows:

(a) Because science and medicine have an international character of their own, it seemed to make sense that DHEW justify before Congress the U.S. funding of international health organizations. However, in recent years domestic problems have so preoccupied DHEW, NIH, and AMA (American Medical Association) that their attention to international concerns has been minimal. Today it would be prudent to consider additional options for a new organizational spokesman for health concerns, as suggested in the Peterson Report, or a combination of services from the National Academy of Sciences Foreign Office and Institute of Medicine.

(b) The diplomatic potential for the worldwide improvement of human health lies primarily in preventive medicine and in related socioeconomic factors. The relatively high level of medical technology in the developed countries is not a primary contributor to this potential, though it may have its uses as a diplomatic tool in dealing with the ruling elites of the less developed nations. Diplomatic efforts should be aimed at providing technologies to benefit the health of whole populations, thereby also substantially promoting development. (As indicated in *The Politics of Global Health*, a correlation study of a broad spectrum of social and economic indicators in 115 countries showed that health variables tended to be the most highly correlated with all other measures of progress.)[149] There is no doubt as to how this factor operates, and most international public health experts, sociologists, and economists understand it. In simple terms, good health equates with social economic, and personal development.

(c) The role of WHO in the administration of programs for the control and eradiction of disease is the same as it was 4 years ago. The importance of that role, however, has been underlined by subsequent events: The growing competition for food and energy resources, heightened perception of environmental problems and the need for controlling them, and further pressures for the advances in family planning. The essentially international character of these problems, along with those of health, becomes increasingly clear, as does the fact of interaction among many of them; a global perspective is essential to their management and ultimate solution.

(d) The 1971 study suggested that the Congress may not have grasped the significant relationship of international health to national health. Since then, other international problems have gained priority in Congress over those in the health field; except in connection with food reserves, congressional attention is perhaps even less focused on international health than it was 4 years ago.

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[149] Quimby, *The Politics of Global Health*, p. 67.

(e) It is more effective to think and plan globally for the health component in the quality of life than it is to make bilateral agreements with other powers to undertake research of interest to them in a certain disease, when in fact, large regions if not the whole world are affected by the disease. Several such bilateral agreements in effect today will probably accomplish less than if the same money were spent on regional centers involving the participation of many nations, developed and less developed. The WHO cancer center in Lyons, France, is a highly effective example; there is an urgent need for other multinational centers focusing on specific diseases.

(f) It was pointed out in the study that evidence did not support the idea that medical assistance should be withheld from less developed countries on the ground that it will merely exacerbate the population problem, but rather—at least in long-range terms—the reverse. In most explicit terms, the study suggested, and quoted authorities who contended, that good health facilitated population control. However, the theory of the relationship of the population growth to improvement in public health measures, combined with rising standards of living, is not well developed.[150] This is a subject deserving of intensive investigation by Congress and additional research efforts in support of such investigation. (See also Issue Three.)

(g) As a result of politically motivated decisions by UNESCO, some Western nations are withholding funds and some scholars are boycotting UNESCO-sponsored meetings. It is too early to determine whether or not such pro-Arab, Communist, and Third World trends will continue in UNESCO. The question, of course, is whether WHO will experience a similar awkwardness and require adjustments beyond those which it has already satisfactorily negotiated in response to similar influences in its Eastern Mediterranean Region. The answer is, probably not; WHO is organized in such a way that combinations of bloc votes in its World Health Assembly have less influence over crucial WHO decisions than do the decisions of its more powerful 24-man Executive Board. On the Board, professional representatives of at least four major powers wield strong technical influence over WHO's major assistance programs. It is important to preserve this arrangement if the United Nations itself should become less effective and future development should leave WHO to go it alone.

(h) In summary, it seems reasonable today to reach conclusions similar to those in the original analysis:

That multinational cooperation in WHO and PAHO will continue to contribute effectively to the technical and organizational health needs of the world, of regions, and of the participating member countries.

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[150] Quimby, *The Politics of Global Health*, pp. 67-68.

That the massive prestige and universal respect commanded by WHO justifies a greater involvement of the U.S. Government and American health experts in supporting and shaping the WHO programs for those global health problems which do not lend themselves to typical bilateral aid.

That a U.S. role of positive promotion of WHO should be viewed as beneficial if not, indeed, essential to the success of that agency's rational attack on world health problems, with commensurate benefits to U.S. national health.

Some Illustrative Questions

The study of *The Politics of Global Health* poses a variety of questions for congressional consideration. The following are some examples:

Would it be desirable, and realistic, for the United States to assume a more positive and supportive role in the field of global health as a means of strengthening its overall diplomatic posture?

If so, what steps should Congress take:

(a) To inform itself more fully about needs and opportunities?

(b) To persuade the American public of the appropriateness of such a move?

What can be learned from public health/preventive medicine and health care programs of the People's Republic of China?

Could the United States effectively promote regional health activities as a low-profile way of contributing to "technological end runs" in areas of military conflict, such as the Middle East, or of lesser political confrontation, as in sections of Africa? Should it seek to do so?

How should U.S. programs in the international health field be coordinated? What should be the respective roles of the Department of State and the mission-oriented agencies?

How effective is the monitoring of the World Health Organization by U.S. agencies? How well do they report on WHO's budgetary needs and the importance of WHO's activities to the United States? Do the White House, the Science and Technology Policy Office (STPO), and/or the State Department take an active interest and play a constructive role in this connection? Who should account to Congress and the U.S. public regarding U.S. support of ongoing and projected WHO activities? Is a new institutional mechanism needed?

Should there be more intensive efforts to inform the public through the press of the existence of the World Health Organization and its objectives and achievements? For example, WHO fully expects its goal of eradicating smallpox from the Earth to be achieved by July 1976. (This will be the first time in all history that man has succeeded in eliminating globally a human disease.)

ISSUE THREE—BEYOND MALTHUS: THE FOOD/PEOPLE EQUATION [181]

In a world shrunk by television, electronic communications, and air transport, the tragedy of famine is increasingly everyone's concern. Although technologies of food production and population control are sufficiently advanced that the age-old problem of feeding the world's people is technically solvable, famine still occurs. Food and people are unevenly distributed over the globe. The undertaking in the study by Dr. Allan S. Nanes is to explore the reasons why the technical balancing of the food/population equation, although feasible, remains unachieved.

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[181] U.S. Congress, House, Committee on Foreign Affairs, *Beyond Malthus: The Food/People Equation*, in the series Science, Technology, and American Diplomacy, prepared for the Subcommittee on National Security Policy and Scientific Developments by Allan S. Nanes, Foreign Affairs Division, Congressional Research Service, Library of Congress, 1971, p. 69. (Committee print.)

Since about 1950 the United States has maintained a substantial program of aid to developing countries. Two main elements of this program have been the strengthening of institutions and measures of enhancing food production and public health. Although agricultural productivity has risen, the death rate has declined and populations have increased so that despite the efforts of the developing countries, with U.S. aid, to improve their food/population positions, the effect is that of being on a treadmill—or worse. The impact of inflation and the raising of petroleum prices by OPEC has intensified the plight of many developing countries. As the problem is summed up by Robert S. McNamara, president of the World Bank:

> . . . Roughly half the population—in the developing world—are neither contributing significantly to economic growth nor sharing equitably in its benefits. These are the poor. Within most developing societies, they form a huge group at the lower end of the income spectrums, receiving only a fraction of what the middle- and upper-income groups do.
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> Some 900 million of these individuals subsist on incomes of less than $75 a year in an environment of squalor, hunger, and hopelessness. They are the absolute poor, living in situations so deprived as to be below any rational definition of human decency. Absolute poverty is a condition of life so limited by illiteracy, malnutrition, disease, high infant-mortality, and low life-expectancy as to deny its victims the very potential of the genes with which they are born. In effect, it is life at the margin of existence.[133]

As these vast deprived populations struggle for sustenance, the technology of the developed world has enabled it to produce large surpluses of food, and to elect by conscious choice the kind of lifestyle it will adopt. The division of the world into rich and poor nations is increasingly a source of bitter resentment at international forums where the subjects of environment, energy, materials, food, and population are discussed with animus and frustration by spokesmen for a majority of the world's sovereign states.

It is in this context, in which diplomacy, technology, and human institutions are closely intertwined, that the study *Beyond Malthus* attempts to define the issue of the food/population equation, its importance, and its significance for future American foreign policy.

Statement of the Issue

The implication of the food/population equation is that mankind must somehow contrive to produce enough but not too much food to feed the world's population, while providing incentives and means for the world's population to hold itself within reasonable bounds. Beyond this dual task is the further task of assuring the development of a system of distribution of food to meet human needs, and a political and economic structure to assure stability of the whole process.

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[133] Robert S. McNamara, *Address to the Board of Governors*, International Bank for Reconstruction and Development, Washington, Sept. 1, 1975, p. 13.

The complexity of the task of evening out the global inequities in food supply and the unbalances in the food/population balance is described by Dr. Nanes in the following passage:

> The problem of achieving a relatively stable balance between food resources and population in the less developed countries is one of enormous complexity. It has biological and medical aspects relating to the development and employment of safe and effective methods of contraception. It involves decisions about basic economic questions such as the allotment of resources, manpower needs, the use of incentives, and the establishment of channels of distribution. It calls for the modification of cultural and social values that have existed, in some cases, for millennia. It affects the internal politics of the developing countries, and adds to the strains on their relatively weak administrative machinery. It tests the effectiveness of communications techniques and training methods. It requires the development of irrigation systems, intensive use of fertilizers, and in the view of many experts the development of new crops even more responsive to fertilizers; this in turn involves research in plant genetics. The depredation of food supplies by animal and insect pests must be brought under control. Improved food preservation techniques need to be developed. Disease, which cuts down the caloric efficiency of ingested foods, must be fought, so that ill health does not diminish the supply of manpower during a planting season, or cause the loss of a crop. In many instances a market economy must be developed where none existed before.
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> What needs to be done is virtually endless, and it is all interconnected. This interconnection of very many diverse elements is characteristic of the entire modernization process in the underdeveloped countries, and the solution of the food/population equation is simply a specialized model of that process.[153]

Undoubtedly the central problem is the construction of political and administrative arrangements to bring to bear the available technologies that can overcome the physical difficulties in the global food/population unbalance. Fortunately, genetic developments in food grains (the so-called "Green Revolution") and a number of innovative technologies to effect population control have come into being within the present generation. "As matters now stand there is at least a chance that development aid, abetted by a skillful and flexible diplomacy and working in conjunction with science and technology . . . could help to bring about a reasonable equilibrium between population and food resources in the so-called Third World." [154]

Importance of the Issue

The issue should be restated in order to highlight its importance. As Nanes puts it:

> Rapidly advancing technology shows promise of enlarging world supplies of food to meet completely the needs of the world's burgeoning population. Technology has also demonstrated that it can be used to slow the rate of human reproduction. On a global basis, mankind need no longer be the inevitable victim of a postulated Malthusian law that condemns some fraction of the total number to starvation or semi-starvation. The question now becomes one of skill in human management: Can man so order himself and his institutions of government and administration that he can make use of the food and population technologies he has been permitted to discover? [155]

The moral aspect of upwards of a billion human beings on the threshold of starvation scarcely needs stressing. However, in a developing country the adverse consequences of an insufficiency of proper nutrition constitute a chain reaction that perpetuates the underdeveloped state of the nation. Calorie deficiencies are measured in reduced output of work. Deficiencies of the eight amino acids collectively designated as "protein" cause physical and mental retardation, a disease called "kwashiorkor," and vulnerability to many normally minor disorders. Thus, the poorer the diet, the higher the incidence of disease, and with it the more difficult the developing country's task in seeking to provide its people with an adequate diet; and as diet-deficient children become adults, the fewer of them will ultimately be qualified to carry out the more sophisticated tasks of economic development.

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[153] Nanes, *Beyond Malthus*, pp. 11-12.
[154] *Ibid.*, p. 12.
[155] *Ibid.*, p. 87.

The population side of the equation is no less important. The world's population is increasing faster than at any time in previous history. Moreover, increases are highest in the underdeveloped countries. "Thus, while the current rate of population growth in North America is 1.2 percent, in Western Europe 0.6 percent, and in the U.S.S.R. 1 percent, in Africa it is 2.7 percent, in Asia 2.3 percent, and in Latin America 2.9 percent." [156] The significance of these rates of population growth in relation to food supply and economic development is of commanding importance. As the author points out:

> There are many reasons to consider the need for national and global efforts to stem the rate of population increase. Population density affects the ability of human societies to preserve the quality of life, to make available adequate resources to sustain life, to maintain order, to govern, to insure the security of the individual from crime, to maintain the security of nations from tension or even insurrection, and to reduce the possibility of international conflicts. Population numbers and rate of increase have a profound bearing on all of these.[157]

Political unrest is a recurrent theme. Thus:

> All phases of development are retarded as long as population eats into economic growth. Investment is held back or channeled into unproductive areas. Job opportunities are not created, and unemployment or underemployment spreads. Social misery continues unchecked, and populations—rural and urban—become increasingly susceptible to appeals to violence.[158]

And again:

> Population pressure in one country (for example East Pakistan) cannot help exerting pressure on its neighbors (for example India). Population differences make bad neighbors, just as affluence and poverty make bad neighbors. This dilemma must be resolved cooperatively if it is to be resolved at all. It will be solved either rationally by agreement among nations and an orderly process of implementation; or it is likely to be resolved irrationally by war, disease, and social disorder within and among nations.[159]

How the Issue Developed

The seriously disproportionate growth of population in relation to agricultural productivity in the developing countries today presents a different picture from that of 19th century Europe or the United States in undergoing their transformations into modern industrialized nations. Abundant fertile and well-watered land in a congenial climate solved the U.S. food problem, further aided by systematic resort to advancing farm technology and capital. Western Europe combined advanced agricultural technology with imports of food, paid for with exports from industry. Japan combined the European practice with extensive resort to food from the ocean. In all three cases, the fortunate physical and technological conditions combined with organizational and educational strengths to assure a self-reliant and well-nourished population.

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[156] *Ibid.*, p. 54.
[157] *Ibid.*, p. 92.
[158] *Ibid.*, p. 96.
[159] *Ibid.*, p. 93.

It is tempting to attribute the food/population unbalance in developing countries today to a lag in technology. Unquestionably, Nanes concedes, it is a factor. However, a more notable deficiency—

> . . . is the general deficiency in knowledge of the complex factors involved. The processes of population growth are not understood. The statistics of food and population are poor. Even the techniques for disseminating improved technology are faulty. Under these conditions, the negotiation of positive diplomatic arrangements and the task of planning programs to achieve the goal of food/population balance tend to be unsystematic and episodic.[160]

The theme of the inadequacy of data on food and population runs throughout the paper. Data are needed for diagnosis of the problems, formulation of policy, design of ameliorative programs, and setting of practicable long-range goals. Associated with the lack of data for these purposes are two other deficiencies: (1) insufficient understanding of the cultural dynamics of each individual society, including its readiness to accept or adapt particular technologies of food production or population control; and (2) the low level of education.

> It would seem to be essential that the base of education be strengthened in all countries so that their peoples can understand the reality of the problem, and to assure that the best available technology bearing on the food/people equation is everywhere available and in the hands of people competent to use it. [161]

U.S. Involvement

Recognition in the United States of the need of the developing countries for enhanced agricultural technology came early. From the outset of foreign aid programs after World War II their content was extensively technological. Their scope encompassed improvements in fertilizer practice, genetic strains, irrigation, farm mechanization, food preservation and storage, and marketing systems. However, defects in the programs were frequent: in the appropriateness of particular technologies to the cultures of various of the developing countries, in the willingness and ability of the aided peoples to use the transplanted technologies, and in the basic data required for planning and programing to introduce improved practices.

Awareness of the population side of the food/people equation as an appropriate target for U.S. policy lagged nearly a decade behind the attention to the factor of food. Thus, in 1959, President Eisenhower declared that, "This Government has not, and will not as long as I am here, have a positive political doctrine in its program that has to do with this problem of birth control. That is not our business." At that time, Nanes observes, the "population explosion" had not attracted general awareness. However, by 1965, Mr. Eisenhower had reversed his stand "when he came out in favor of measures authorizing the Government to cope effectively with the need to slow down and then stabilize the world's population growth." [162]

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[160] *Ibid.*, pp. 6–7.
[161] *Ibid.*, p. 94.
[162] *Ibid.*, pp. 9–10.

U.S. POLICY NEED OF FACTS ABOUT FOOD AND POPULATIONS

On both sides of the food/people equation, U.S. diplomacy has a concern related to world peace and stability. Accordingly, the report suggests, ". . . It would seem to be advantageous for U.S. long-range policy to search out and exploit every available opportunity to establish a solid and scientific, factual base of information about this equation for individual nations, for the regions of the world, and worldwide."[163]

In relating diplomacy and national policy to the food/people equation, it is important to recognize that the United States has a profound long-range interest in the achievement of balance, but has a powerful influence on only the food side of the equation. As the world's largest producer of food, and possessing the most advanced technology of "agribusiness," the United States is in a strong position to export both food and food technology. Leverage on the other term of the equation was for long limited to the capability of exporting technology and managerial skill—without, however, any certainty that either of these intellectual exports would be compatible with the cultures and political structures of the nations facing the severest population pressures. The possibility that the United States might use the leverage of food surpluses in a compelling way to motivate population policy decisions was not considered. Even the provision of U.S. assistance to voluntary population control programs was not a factor before the mid-1960s. Legislation in 1966 authorized the use of U.S.-owned or U.S.-controlled foreign currencies to assist voluntary family planning programs in countries requesting such assistance. Then, the "Foreign Aid Act of 1967 not only put the stamp of approval on U.S. assistance to family planning programs in the LDCs; it also earmarked funds, for the first time, for this specific purpose. The amount so designated in 1967 was $35 million. Thereafter the amount was to increase annually." In 1968 the legislation renewing Public Law 480 (Public Law 90–436) also earmarked funds for population-related programs.[164]

It is possible to foresee a time in the future at which demands for food exports from the United States will far outstrip the Nation's capacity to deliver. At such a time, what policies will govern the allocation of food to the needy? Will relevant priorities include best effort on the part of claimants to expand their own production of food, or to stabilize their own populations?

Role of Congress

In 1954 the Congress moved in a major way into the problem of global food supply with passage of the Agricultural Trade and Developmental Act of 1954, better known as "Public Law 480." This act established the policy of Congress "to make maximum efficient use of surplus agricultural commodities in furtherance of the foreign policy of the United States." Although the main emphasis of the program established under this act was the liquidation of surpluses, the resultant food aid was massive. Between 1954 and 1967, exports of Public Law 480 agricultural products amounted to $17.2 billion; recipients were 116 countries with half the world's population. However, during the administrations of Presidents Kennedy and Johnson, defects in the program became apparent. In particular, the flow of of U.S. foodstuffs enabled foreign governments to evade the making of hard decisions on agricultural development, internal reforms, and population matters. As recorded by Dr. Nanes, the response of Congress was to redirect the thrust of the program to motivate needed reforms:

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[163] *Ibid.*, pp. 93–94.
[164] *Ibid.*, pp. 74–75.

> In 1966, Public Law 480 underwent a major overhaul; the program of food assistance was tied directly to the efforts of the developing countries to limit their population growth. These changes can be found in the Food for Peace Act, Public Law 89–808. In the first place, the entire rationale of the law was changed. Instead of a device to dispose of U.S. agricultural supluses, the new law advances a program to combat hunger and malnutrition and assist economic development, particularly in those countries that do the most to help themselves. In line with this program, the President is directed, in negotiating and carrying out agreements for the sale of agricultural commodities, whether for dollar credits or foreign currencies, to take account of the efforts of the other countries to meet their problems of food production and population growth. In the Foreign Assistance Act of 1968 one of the purposes for which agreements concerning the use of foreign currencies can be made is that of ". : : activities, *where participation is voluntary*, related to problems of population growth. : : . Not less than five (5) percentum of the total sales proceeds received each year shall, if requested by the foreign country, be used for *voluntary* programs to control population growth." (Emphasis added.) That same law also contained a provision stipulating, as one of the self-help criteria the developing country must meet in order for the President to agree to the sale of agricultural commodities, the criterion of "carrying out voluntary programs to control population growth." This is stronger language than that which would merely take account of LDC efforts at self help.[165]

Concern continues, however, "lest unchecked population growth lead not only to starvation in the LDCs, but to the wreckage of international development as well." In Dr. Nanes' opinion, "It seems likely that the Congress will continue to monitor events in the field of population with a view to the possible passage of legislation to make U.S. policy in this area more effective." [166]

Status of the Issue in 1971

The distinction between cases and issues in the separate studies of Science, Technology, and American Diplomacy is that the cases represent discrete events with some sort of terminus while issues are by nature continuing and inconclusive. The summation of the study of the issue of the food/people equation conforms with this distinction:

> The final result of the international campaign to bring food and population into balance in the LDCs—in such a way that economic development can go forward, and an acceptable level of human welfare can be achieved and sustained—cannot be foreseen. Certainly the challenge is as difficult as any ever faced by man; it calls for the careful management of a complex interaction of scientific knowledge, diplomacy, and social engineering. At the beginning of the decade of the 1970s, the issue is very much in doubt. In the years ahead, the extent and character of the U.S. effort can have a crucial effect for good or ill. [167]

By 1971 it had become evident that the problem of balancing the food/people equation was not fundamentally a technological one. It was true that further applications of science were needed, and efforts were underway to provide them. But, with respect to food supply the genetic developments of the Green Revolution presaged a large increase in the production of feed grains. More intensive use of fertilizers offered opportunities of further major gains. Also of importance was the application of well-established technologies of food preservation, storage, and protection against depredations of pests. With respect to population stabilization, the evidence of the developed countries suffices to demonstrate that sharp increases in numbers are not an inevitable consequence of rising affluence but rather the reverse. However, the primary factor missing in the developing countries is the complex of institutions and organizational arrangements to create the social, cultural, economic, educational, and other modifications in human behavior and relationships that collectively result in the motivation of a population to relate its numbers to its resources. In 1971 the rate of population increase was steepest in the countries least able to sustain it. While the United States was exerting increasing pressure on these countries to develop an institutional capability to stabilize the food/people equation, the traditional emphasis of the United States on freedom of individual choice, combined with respect for cultural and religious values, tended to negate official pressures for dealing constructively with the population side of the equation. By itself, the encouragement of food production in the developing countries, supplemented by U.S. exports, was no adequate answer.

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[165] *Ibid.*, p. 38.
[166] *Ibid.*, p. 84.
[167] *Ibid.*, p. 96.

FOOD/PEOPLE EQUATION AS INDEX OF DEVELOPMENT

The status of the food/people equation is an excellent index of development. But development must deal with a far larger scope of programs than food production and population stabilization. To achieve the necessary level of progress, including the equation discussed here, requires strengthened organization of political forms, improved educational and public health institutions, more comprehensive and timely gathering of statistical data, systems of technology transfer (as for example the highly successful U.S. system of agricultural county agents), rail and highway transport, and other elements of technological infrastructure.

Prospects and Options Suggested by the Study

A number of policy issues that might merit congressional attention can be drawn from the study. Others, coming out of the 4 years of experience since the study was first issued, amplify but do not alter the general thrust of the report.

BILATERAL VERSUS MULTILATERAL APPROACH

The study divided its attention between two kinds of approaches to the food/people equation: one was the U.S. bilateral approach in which food was used directly as aid and indirectly as a motivation for population control by the aided country; the other was the efforts of the United Nations and associated U.N. institutions, chiefly the Food and Agriculture Organization and the World Bank, to deal with the problem on a global basis. Neither approach has scored marked success and even diagnosis of the problem lacks specificity. The fault appears to lie more in the field of the social sciences and their application than in the field of technology.

It is contended by some analysts that a stronger support of the U.N. effort might have been more rewarding than the U.S. practice of emphasizing bilateral aid. This is possible, of course. Multilateral aid was shown in the study to have a number of particular advantages in this field, as also in the field of global health. Some of these advantages are identified by Dr. Nanes as follows:

> The inherent advantage of multilateral over bilateral assistance is that the diplomatic profile of the donor is lowered. Motives of the donors are under less suspicion. Another presumed advantage is that recipients may be more likely to contribute substantively to the planning of general programs. If they are involved in the planning, they are more positively committed to the implementation of plans. Burdens of cost can be more widely distributed. Results can be better analyzed on the basis of international comparisons. Contributions to a genuinely global program can be expected to come earlier from those nations which are initially recipients. Some forms of assistance practically demand a global approach.[168]

However, Dr. Nanes also warns that the multilateral approach is not without its present defects:

> The asserted advantages of the multilateral approach to world agriculture should not obscure the evident weaknesses of present institutions to accomplish purposes generally sought. Some of the weakensses attributed to the U.N. complex have included: Uncertain funding, varied quality of technical personnel, wavering political support, confused lines of functional organization, want of firmness in management, and absence of accepted overall authority. The desirability of a clearer mandate for specific global chores to be implemented by this system, and a general overhaul and strengthening, would appear to warrant early legislative and diplomatic consideration.[169]

One major example of multilateral aid is the program of the World Bank under the leadership of President McNamara. This institution has identified five principal "roadblocks" to enhanced agricultural productivity in poor regions (paraphrase):

1. Where poor farmers are struggling to subsist on semiarid or marginal land, there is a critical need for new agricultural technologies tailored to these conditions.
2. Another roadblock is government-imposed pricing and subsidy policies to provide cheap food to the cities at the expense of reduced incentive to rural areas to expand agricultural productivity.
3. The small farmer is almost always discriminated against by public institutions, which tend to favor the larger and more prosperous producers in terms of access to public credit, research, water allocations, and scarce supplies of petroleum, pesticides, and fertilizer.
4. There is a scarcity of trained technicians to implement complex rural operations.
5. Finally, all of us have a great deal more to learn about the motivational patterns and behavioral responses of the poor in shifting from traditional subsistence agriculture to cash-crop production.[170]

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[168] *Ibid.*, p. 90.
[169] *Ibid.*, p. 91.
[170] McNamara, *Address to the Board of Governors* (op. cit.), pp. 16–18.

PROBLEMS OF THE GREEN REVOLUTION

There is irony in the fact that one of the most successful technologies to increase agricultural productivity—the genetic achievements referred to as the "Green Revolution"—has created many socioeconomic problems by its very success. As Dr. Nanes explains:

> Broadly speaking, the problems set in train by the Green Revolution fall into two categories: (1) Those appearing within the LDCs themselves, as a result of the political, social, and economic effects of the new technology; and (2) the consequences for the developed nations of the world of the appearance of the new abundance of staple food commodities. The actions taken in response call for three sets of organizational entities: (1) institutions and organizational arrangements within the LDC itself to smooth the path and ease the dislocations of the Green Revolution; (2) bilateral arrangements, such as between the United States and an LDC; and (3) international or multilateral agreements and systems to provide global stability, unify international purposes, and ease international conflicts arising out of the changed patterns of trade.
>
> The prospective abundance threatens to generate several kinds of problems within the LDCs. Gains in food production may be poorly distributed from one district to another, as between East and West Pakistan. They may benefit the wealthier farmers while leaving the poor farmers even less well off. Both of these effects generate tensions within a country. The already evident flight from the farms to the cities is likely to intensify, with unemployment increasing in both poor rural areas and cities. All of these effects call for mediation and corrective action by the LDC governments, and in some cases for hard decisions on the part of political leaders. If the alternative is between governmental overthrow and outside assistance, it would seem to be important for the United States and its diplomats to know what form such assistance should appropriately take. It would seem also to be important to know in which countries such outside assistance would be likely to be effective, and where it would be merely support for a losing cause. Among the kinds of support that have been mentioned are: Improved credit resources more widely available at regional and local banking levels; more widespread and longer education of the population; encouragement of the use of labor intensive farm equipment; assistance to small farmers in the exploitation of the new genetic forms of grain; increased opportunities for rural industry; improved arrangements for storing surplus grains and preventing losses to pests; better arrangements and facilities for the marketing of agricultural products; and above all, a strong administration of government, equipped with adequate taxing power and management skills to distribute equitably the costs and gains of the Green Revolution [171]

PROBLEMS OF STABILIZING POPULATIONS

Applied sociology is certainly important in meeting the challenge of the food/people equation. Its relevance to the task of raising agricultural productivity is stressed by Mr. McNamara. However, its importance for the other term of the equation—the stabilizing of populations—is even greater. On this point Dr. Nanes writes:

> If the food/population problem in the developing countries is to be brought under control, there must be strong motivation for couples to limit the number of their children. Mere expressions of general interest in the idea of fertility control will not suffice. For example, surveys have been made which suggest that 70 percent of the women interviewed were interested in controlling the size of their families, but experience indicates that this does not mean that all of these women will use family planning services if they are made available. Presumably the same applies to men. In any event, there is little information on incentives and inducements for birth control in the LDCs, particularly where strong motivation is necessary to overcome cultural barriers to contraception.

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[171] Nanes, *Beyond Malthus*, pp. 88-90.

> Among other behavioral matters in which additional data would be helpful are the following: the sociopsychological aspects of male-female interaction; socioeconomic factors affecting human behavior relative to marriage, fertility, and migration; and social processes leading to cultural change. Human behavior is, after all, the most critical factor in maintaining a balance between population and available food resources, and indeed in the whole development process.[172]

For the United States alone, or under bilateral arrangements, to embark on studies of this sort would seem less appropriate than for this country to give vigorous encouragement to their pursuit by agencies of the United Nations. The reasons given above by Dr. Nanes for the virtues of multilateral programs appear almost uniquely applicable to this area. On the other hand, U.S. skills in agricultural technology might well be suited to transfer under bilateral arrangements. The technology appropriate to the U.S. climate, soils, economy, and other factors might not generally be suited to developing countries. But U.S. research methods and the remarkably successful U.S. methods of transfering technology from the research station to the individual farmer could be widely useful abroad.[173]

Author's Reassessment in 1975

The main theme of the study is the interrelationships among food supply, population growth, and the entire process of development. Subsidiary themes concern food requirements and the technology of food production, the technology of birth limitation, and the problem of motivating people in the developing countries to adopt available birth control techniques. The study is further concerned with the organizational concepts, plans, programs, and international arrangements designed to operate on these variables. The enormous human complexity of the food/population problem—social, cultural, economic, religious, administrative, political, diplomatic—is suggested as an overlying theme.

RELEVANCE OF THE STUDY 4 YEARS LATER

These themes seem unquestionably as relevant today as at the time the study was written. The importance of the food problem has been pointed up again in recent months by the famine in the Sahel and elsewhere, and by the World Food Conference, proposed by the United States and held in Rome in November 1974. Population growth continues essentially unabated, while a key effort to control such growth, namely, the program in India, appears to have failed. The solution of the food/population dilemma remains crucial if the poverty of the underdeveloped countries is to be substantially alleviated.

In this connection it may be noted that there has been some change in the philosophy of development, with a number of experts now contending that first priority should go to the upgrading of agriculture, not only for the purpose of increasing the indigenous food supply, but also as a means of providing employment. It is suggested that the latter objective be achieved by the use of labor-intensive, rather than capital-intensive, methods. (In other words, the most modern techniques may not necessarily be the most applicable, as far as the less developed countries are concerned.)

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[172] *Ibid.*, p. 11.

[173] On this point see U.S. Congress, House, Committee on Science and Technology, ***Agriculture Research and Development: Background Papers***, prepared for the Subcommittee on Science, Research, and Technology and the Subcommittee on Domestic and International Scientific Planning and Analysis. September 1975, pp. 25-26. (Committee print.)

If the study were to be rewritten today there would be no change in its emphasis in any significant way. Few changes appear to have occurred in the subject covered except that, as noted above, the food problem has become even more critical. Parts of the sections on the technology of the problem, particularly the technology of birth control, might need revision in light of the latest research.

The study is as important to congressional concerns as when it was written, and perhaps even more so. Recent famines, the World Food Conference, and the earlier World Population Conference in Bucharest have highlighted the problems of food and population once again. U.S. food export policy appears to have become a more important political issue than it was during the period when the study was in preparation.

The study seems as relevant now to the project series as at the time it was written. Certainly the relationship of food supply to population is one that is markedly affected by the state of technology in each of these fields. It is equally certain that the food/population problem is at the forefront of the concerns of world diplomacy. Consequently the study can still serve as a highly appropriate vehicle for exploring the interaction of science, technology, and diplomacy.

FOOD/POPULATION PROBLEM INSEPARABLE FROM DEVELOPMENT PROCESS

Among the more significant observations of the study were the following: (a) The food/population problem cannot be separated from the total process of development—development is a seamless web. (b) The growth of world population is outpacing food production, and available techniques have not been applied sufficiently to achieve increased production and more efficient marketing of agricultural produce on the one hand, or slow down the rate of population increase on the other. (c) The achievement of a global balance of food and population will require improvements in political, economic, social, and diplomatic organization and management. (d) The devising of programs to deal with both sides of the food/population balance is a matter of great urgency. (e) If economic development becomes a kind of treadmill, with gains in development nullified by gains in population, the United States will have spent many billions of dollars to no lasting purpose. In such a case U.S. foreign aid is likely to be terminated, and the task of U.S. diplomacy in the underdeveloped world is likely to become far more difficult than it already is. (f) A solution of the food/population issue, while not guaranteeing the success of U.S. and other development assistance programs, will presumably permit the assignment of additional resources to other phases of development now receiving less attention. (g) The problem of the food/people equation is so complex that its solution is bound to be piecemeal and incremental, and to contain a fair amount of trial and error. (h) Regardless of the total cost of coping with the rapid increase in world population, it is important that every success be as visible as possible. If expenditures for family planning and population control activities show no results, it is unlikely that support for this type of activity can be sustained with Congress and the public.

These same points would still be stressed in such a study today. The emphasis would probably be essentially the same, although some space might be given to the arguments and counterarguments of those who say that there is enough arable land to support a far lager population than now inhabits the globe.

EARLY CONGRESSIONAL RECOGNITION OF PROBLEM

The study pointed out that Congress had recognized the problem of controlling population growth as early as 1963, and that Congress was equally responsible with the executive branch for assigning the highest priority under the U.S. Foreign Aid Program to family planning and population activities. Given current conditions, a similar assessment of priorities would appear in order. The study also pointed out that it would be advantageous for the United States to search out and exploit every available opportunity to establish a solid, scientific, factual base of information about the food/population equation, for individual nations, for the regions of the world, and for the world as a whole. The study pointed out certain fundamental weaknesses in the data on food and population, and since those weaknesses have not, apparently, been remedied, Congress should still be interested in ways to strengthen the basic stock of information about these subjects. In addition, recent shortfalls in production, combined with natural disasters, have produced several instances of famine, thereby thrusting the question of food export policy to the front rank of congressional concerns.

In general, the study identified problems for the Congress that still exist. The complexity of the problem area was emphasized, as was its central position in the entire process of development. The crucial role of technology with respect to both food production and the limitation of family size was highlighted. The study also identified the problems remaining in agricultural production as a result of the Green Revolution, and raised the issue of U.S. foreign agricultural policy in relation to the less-developed countries. The social and psychological barriers to the effective use of present technology in the field of birth control were emphasized, as was the extreme sensitivity of the issue as a matter of bilateral diplomacy. It was suggested that in this field a more hopeful route might lie through multilateral action.

The foregoing observations could serve to stimulate thinking in Congress should legislation in the food/population area be under consideration. The questions to which they might give rise are as valid now as they were when the study was in preparation.

Some Illustrative Questions

What factors are relevant in determining the optimum population numbers on a global basis? If infinitely continued growth is physically impossible, should circumstances be allowed to determine the point at which growth should stop? Or, should the determination be made as a result of a conscious policy decision? By what criteria should such a decision be made? Are the criteria the same for all countries and for all time? Who should decide? How is the decision to be given practical effect? What are the implications of these questions for U.S. diplomacy and long-range diplomatic planning?

What is the comparative cost/benefit advantage of multilateral versus bilateral programs in dealing with the food/people equation in developing countries?

What are the implications for future U.S. diplomacy of the increased reliance of developing countries on U.S. food supplies? How is this reliance to be reconciled with U.S. commitments to supply grain to the U.S.S.R., a large part of which is designed to facilitate Soviet production of meat for internal consumption?

How long will the extensive conversion of grain into meat remain an acceptable practice for the United States or any other country, in view of the emerging necessity for conservation of foodstuffs?

What improvements might be achieved, and to what end, in U.S. relations with the Food and Agriculture Organization of the United Nations, the World Bank, the United Nations Fund for Population Activities, and the United Nations Population Commission?

How can U.S. expertise in agricultural R. & D. methodologies and technology transfer be effectively made available to developing countries?

Might food surplus countries act cooperatively to ease food shortages elsewhere? Would it be feasible to balance food supply and demand within geographic regions?

Could a situation arise in which world food needs so exceeded the available supply that the leading surplus countries, perhaps in conjunction with the United Nations, were obliged by circumstance to resort to the triage procedure in allocating food to needy countries?

How long will present maldistribution practices continue, and what populations are likely to be exposed to widespread starvation meanwhile?

Is there currently enough food to feed the world's population? Are shortages the result of failures in production, or distribution?

If world population continues to increase at the present rate, and assuming no further technological breakthroughs in agriculture, is there likely to be a breakdown on a massive scale of the world's ability to feed itself, and if so, when might such a breakdown be expected to occur?

What is the best general estimate of the impact of the Green Revolution on the less-developed countries? Should additional inputs of modern technology be made available to the agriculture of those countries, and if so, in what sectors? How should it be disseminated?

Should the United States continue to give priority in its aid programs to family planning assistance? Would such programs be more effective if transferred to multilateral sponsorship?

ISSUE FOUR—U.S. SCIENTISTS ABROAD: AN EXAMINATION OF MAJOR PROGRAMS FOR NONGOVERNMENTAL SCIENTIFIC EXCHANGE[174]

U.S. Government arrangements for sending nongovernmental technical[175] personnel abroad to study, conduct research, attend meetings, or lecture have been initiated at intervals over the past three decades. A number of these arrangements were made in the immediate post-World War II period; some were established as a response to the launching of Sputnik in October 1957; but most are of more recent origin "reflecting current trends toward relaxation of international tensions and broader understanding of the benefits to science and society of cooperative international science."[176] Today, the Government "maintains a vast array of programs with varying origins and purposes. Americans are sent abroad for information exchange and the advancement of scientific knowledge; to meet goals of prestige; to support the development of a science infrastructure in the developing countries; and to meet the terms of bilateral and multilateral agreements for cooperation—agreements which serve both science and foreign policy goals. Scientific and technical exchanges are the largest part of U.S.-sponsored exchange programs."[177]

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[174] U.S. Congress, House, Committee on Foreign Affairs, *U.S. Scientists Abroad: An Examination of Major Programs for Nongovernmental Scientific Exchange*, a study in the series on Science, Technology, and American Diplomacy prepared for the Subcommittee on National Security Policy and Scientific Developments by Genevieve J. Knezo, analyst in science and technology, Science Policy Research Division, Congressional Research Service, Library of Congress, U.S. Government Printing Office, Washington, D.C., April 1974, 168 pages. (Committee print.)

[175] As used in this commentary, the word "technical" generally encompasses science and technology.

The general assumption of the study is that international scientific exchanges are beneficial. The emphasis on critical analysis of the ongoing programs and identification of weaknesses and flaws in their execution should not obscure their merits. A few examples of these positive values might include—

Providing a basis for comparison of United States and foreign science;

Enabling the tapping of small pools of high competence in specialized fields of science abroad, sometimes surpassing the levels of U.S. achievement;

Supporting the international bridging function of science;

Extending the reach of U.S. science;

Training future candidates for posts as U.S. scientific and technological attachés;

Familiarizing young scientists with the reality of the world scientific community;

Providing a future basis for a two-way transfer of technology; and

More generally, broadening the technical and cultural experience of the participants.

It is evident that international scientific exchanges contain these potential benefits. The intent of the study was to suggest ways in which these benefits might be more positively sought, and to indicate that program designs require a solid foundation of factual information for their evaluation and improvement.

Statement of the Issue

Administrative inadequacies in most of these programs make it difficult to evaluate their effectiveness and accomplishments. In general, they suffer from inadequate direction, coordination, and review. Both direction and review are hampered by lack of a clearly defined U.S. Government set of international science policies. Instead, the State Department issues detailed, somewhat random lists of political, security, economic, scientific and technological, and humanitarian objectives for U.S. international science and technology programs. Little attention is given to determining priorities systematically or even to relating the programs to the objectives outlined by the

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[176] Knezo, *U.S. Scientists Abroad*, p. 1.
[177] *Ibid.*, p. 150.

State Department.[178] Review, including congressional oversight, is further inhibited by a paucity of evaluative data—"most of these programs do not incorporate effective provisions for continuous collection, analysis, and dissemination to the public of data required to evaluate the contributions of the program to the advancement of the sciences or to promotion of cooperative international scientific activities." [179]

> A number of factors militate against coordinated program planning. One of these is that U.S. international science programs and policies have not been fully recognized as part of either foreign policy or science policy. A second is that while each program has a number of overlapping purposes, each is carried out under its own statutory authority and is reported to different congressional committees. A third is that some bilateral agreements provide for funding and program commitments which are rarely brought to the attention of Congress until they are a *fait accompli.*
>
> A fourth consideration which must minimize expectations of effective coordination is the unsuccessful history of actual attempts to provide this function. Two agencies have had responsibility in the past for coordinating, on a government-wide basis, international science policies and exchange policies. These are the International Committee of the Federal Council for Science and Technology and the Bureau of International Scientific and Technological Affairs, Department of State.[180]

An account of the unsuccessful coordination efforts is given later in this commentary.

But it is the problem of basic policies that should probably warrant greatest congressional attention. Along with exchange programs serving the legitimate interests of détente, development, and science for the sake of science, is the United States placing enough emphasis on sending abroad persons qualified and alerted to identify and assess trends in both high and low technology[181] from which U.S. industry and research laboratories could benefit? Do the exchange programs treat technology transfer as a two-way street? Is the ratio of applied to basic scientists in the programs commensurate with this purpose? How systematic is the search, in different technical fields, for opportunities for significant transfers to as well as from the United States? In reviewing and considering relative priorities for the overall U.S. program of sending technical personnel abroad, are U.S. policymakers giving thought to the appropriate balance among the disciplines, not for the present day but in terms of what will be needed in the United States 10 and 20 years in the future? In examining the three principal U.S. exchange programs and considering problems of direction, coordination, and review, this study also sets the stage for examining such broader policy questions as these.

Importance of the Issue

Weaknesses in administration and evaluation of exchange programs described in this study are symptomatic of a more important problem: a corresponding gap in U.S. international science policy and policy machinery. The programs are nominally governed by a collection of stated goals, but the goals sometimes conflict and do not add up to a coherent policy (and in any case are not systematically adhered to). Mechanisms and procedures for coordinated direction are lacking in the executive branch; reporting procedures are inadequate for review and evaluation; further obstacles to effective review exist in the complexity and variety of the programs and the manner of their administration in the executive branch, and in Congress in the fact that the programs relate to a number of different committee jurisdictions.

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[178] *Ibid.*

[179] *Ibid.*, p. 151.

[180] *Ibid.*, pp. 153–154.

[181] See the essay on this subject which follows for an explanation of these terms.

Analysis of any governmental program area calls for attention to such questions as: What are these programs for? What are they accomplishing? But what gives the present issue special importance is that it tends to raise the more fundamental questions: What, in the large, are (or should be) U.S. purposes in today's world? How should the U.S. Government organize itself to seek answers to this question, and to take action accordingly?

How the Issue Developed; U.S. Involvement

As both this study and that on the Brain Drain (Issue Five) bring out, since antiquity scientists have been traveling to other countries to study and to teach—often under the sponsorship of governments. However, the official educational exchange programs of the United States are of recent origin. Before World War II they were small and confined largely to Latin America. During the war, educational and cultural exchange programs were replaced by informational and propaganda efforts. The immediate postwar period saw U.S. exchange and assistance activities characterized by mixed educational, cultural, and informational aims. Such activities on a large scale became part of the 1945 occupation programs in Germany, Austria, and Japan. Beginning in 1947, technical assistance under the Marshall Plan had important educational and scientific aspects. The Point IV Program, initiated in 1950, was designed to provide American technical expertise to the developing countries.[182]

Since the late 1940s there has been an unprecedented expansion of activities involving international communication and movement by U.S. specialists, particularly in technical fields. At the private nongovernmental level, scientists exchange information through the printed word, through channels increasingly provided by multinational corporations, and through personal visits and correspondence. Some Government programs send U.S. technical specialists abroad on official missions designed to obtain or disseminate information in support of national defense and security objectives or the maintenance of U.S. installations abroad. Other official programs give substance to humanitarian objectives of U.S. foreign policy in such areas as development aid and disaster relief. Still others promote internationally sponsored cooperative research efforts. In all, they involve the movement abroad of thousands of U.S. personnel and the expenditure of hundreds of millions of dollars annually.[183]

Many of those millions, and some hundreds of the persons, are involved in U.S. Government programs which support the activities in foreign countries of nongovernmental scientist and technologists.

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[182] See Chapter Four—"The Point IV Program: Technological Transfer as the Basis of Aid to Developing Countries"—in: U.S. Congress, House, Committee on Science and Astronautics, *Technical Information for Congress*, prepared for the Subcommittee on Science, Research, and Development by Genevieve J. Knezo, Science Policy Research Division, Congressional Research Service, Library of Congress, Washington, D.C., U.S. Government Printing Office, Apr. 25, 1969 (revised Apr. 15, 1971), pp. 61-96.

[183] A survey conducted in 1969 by HEW at the request of Congress found that 31 agencies of the Government were administering 159 programs for two-way exchanges of scholars or for other foreign or international education activities. These programs were authorized by 42 legislative acts and cost "somewhere between $400 and $800 million annually." (Knezo, *Scientists Abroad*, p. 17.)

The question of what role such programs do or should play as instruments of U.S. foreign policy and how they can best be managed represents a continuing issue. For purposes of manageability, the study focuses on the programs of three agencies, and mainly on the time period 1960–70.

AGENCIES INVOLVED IN U.S. EXCHANGE PROGRAMS

The three agencies are the Department of State, the National Science Foundation (NSF), and the National Academy of Sciences–National Research Council (NAS–NRC). The State Department is responsible for the Senior Fulbright-Hays Program. This program has been funded by the Bureau of Educational and Cultural Affairs (CU) and administered by the Committee on the International Exchange of Persons (CIEP) of the Conference Board of Associated Research Councils, National Academy of Sciences, in cooperation with binational commissions in host countries. It seeks to promote educational exchange and cultural understanding as objectives of U.S. foreign policy; the concerns of science are secondary to the objectives of cooperation.

The National Science Foundation administers four sets of exchange programs: (1) bilateral science agreements with the countries of Europe, Latin America, and Asia; (2) programs supporting international travel and meetings of technical personnel; (3) National and Special Research Programs (major research efforts, often interdisciplinary, of very broad scope or relating to specific geographic areas and requiring extensive international and U.S. domestic coordination); and (4) awards tenable abroad under NSF's research and educational support programs. The NSF programs, designed originally to strengthen the Nation's domestic science base, have been broadened to include initiation and support of foreign and international science and technology. They emphasize science for science's sake.

The National Academy of Sciences-National Research Council programs implement bilateral inter-Academy agreements for scientific cooperation which are part of Cultural Relations Agreements signed by the United States with the Soviet Union, Poland, Hungary, Romania, Czechoslovakia, Yugoslavia, and Bulgaria, and also support activities of the NAS–NRC-affiliated Committee on Scholarly Communication with the People's Republic of China (CSCPRC). The Soviet and East European exchange programs are funded by the NSF Office of International Programs and administered by the Section on the Soviet Union and Eastern Europe of the Commission on International Relations, NAS–NRC. These activities represent an attempt to establish fruitful scientific exchanges between States separated by wide differences in ideology.

These three major program areas are representative of U.S. Government-sponsored activities for nongovernmental technical personnel abroad; they are the largest, oldest, and most publicized of such program areas, and have wide geographical distribution. *Scientists Abroad* describes each of the program areas in some detail.[184]

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[184] See the following sections of the study: II. The Fulbright-Hays Program for Senior-Level Exchanges (pp. 17–43); III. National Science Foundation Programs for Americans Abroad (pp. 44–109); and IV. United States and Soviet-Eastern European Inter-Academy Scientific Exchanges (pp. 110–142). The study also contains a brief section on developing relations with the PRC: V. Scientific Exchanges with the People's Republic of China (pp. 142–148).

Taking each in turn, this commentary will provide only such further description as seems essential to a general understanding of program goals, scope, activities, and management. The main purpose here is to highlight policy and administrative gaps or problems, as identified by the author of the study and as they may shed light on the interaction of science, technology, and American diplomacy. As indicated earlier in this commentary, the undeniable advantages of foreign exchanges of scientific personnel should not be dismissed; rather the purpose of the study was to suggest ways in which they could be maximized. The further point implicit in the study is that U.S. skills in organization and management have been insufficiently exploited in this area, and that a part of the task of U.S. diplomacy might be to correct this deficiency.

THE FULBRIGHT-HAYS (STATE DEPARTMENT) PROGRAM

"The Nation's first large-scale legislative program for international educational and cultural exchange began in 1946 when Senator William Fulbright sponsored an amendment to the Surplus Property Act of 1944 to authorize a mutual exchange of scholars with 22 countries, financed by foreign countries derived from the role of surplus U.S. war materials abroad":

> The Fulbright program differed significantly from previous overseas scholarship activities. These factors continue to characterize it today.
>
> First: The program was conceived so as to minimize involvement with propagenda and cultural imperialism and to insure bilateral cooperation, by, (a) requiring that the United States and each participating country sign formal exchange agreements to authorize the program, and (b) by establishing binational foundations or commissions, composed equally of U.S. citizens (including the U.S. Ambassador) and foreign nationals, who would assist in local program selection and administration.
>
> Second: Architects of the program sought to establish an administrative framework neither too dependent nor too independent of foreign policy by, (a) Placing overall administrative responsibility for the program in the Department of State; but also by (b) establishing a Board of Foreign Scholarships (BFS) charged with selecting all participants and with general supervision of the program.
>
> Responsibility for administration and execution of the program was given to the Bureau of Educational and Cultural Affairs (CU) in the Department of State, which also administers other U.S. exchange-of-persons programs. CU, acting under broad policy outlines set by the Board provides administrative staff and secretariat for the program, negotiates agreements covering educational interchange with foreign governments, maintains liaison with U.S. embassies and consulates overseas, and in Washington cooperates with other U.S. Government and private agencies on particular aspects of the program.[185]

According to one historian of this era: "The Fulbright program . . . fitted perfectly the spirit of the times. International-minded academic and civic groups saw in it an appealing and practical means to promote world understanding." [186]

The program is not a massive one. The total number of lecturers and research scholars involved, in all geographic areas, was 1,229 in 1967–68, a peak year. Of the 1,229, 355 were in natural and applied sciences, 309 in social sciences. The cost of the entire program in 1967–68 was $33,722,523.

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[185] *Ibid.*, p. 20.

[186] *Ibid.* The quotation is from *The Fourth Dimension of Foreign Policy: Educational and Cultural Affairs*, by Philip H. Coombs.

After its first few years of operation the Fulbright program came under increasing criticism. Some felt that it was too limited—limited to academic exchanges, to countries where the United States happened to own "excess foreign currencies," to payment of transportation costs of foreign students coming to the United States but not the costs of supporting them here, and so on. Other critics, including Members of Congress responding to the growing intensity of the cold war, wanted either to abolish the program or to link it more closely to U.S. information and propaganda activities. (Action taken after congressional debate on the aims of the program is mentioned in the following section on the *Role of Congress.*)

Lack of Evaluation Procedures a Program Weakness

A weakness of the program throughout its history has been a lack of adequate evaluation procedures. As a consequence, not enough attention has been given to systematic improvement of planning and programing. The author comments [187] that the need to assess the effectiveness of the program has been pointed out repeatedly. According to the program's first advisory commission in 1961: "We still know too little about the processes of communication between cultures, of attitude formation, of educational development in relation to other aspects of national development." The successor advisory group, the U.S. Advisory Commission on International Educational and Cultural Affairs, has repeatedly called for development of a research capability in the Bureau of Educational and Cultural Affairs. For example, in its seventh annual report, *A Multitude of Counselors* (1970), the Commission reiterated its recommendations: ". . . We believe that the development of a social science research capability in the Bureau is a functional and urgent management requirement. . . . Institutionalizing the evaluation and research function . . . would give it the staying power which 'contracting out' lacks. It would also provide the daily evaluation and research continuity which operators of the program cannot themselves provide." [188]

Because of this shortcoming, the scientific exchanges which constitute more than half of the Fulbright-Hays program [189] apparently have not been evaluated in depth by agencies administering the program:

> As a result, there are almost no appropriate measures of the impacts of scientific exchanges, that is, accomplishments of grantees with respect to both the advance of science and the promotion of scientific and political cooperation between the United States and the Fulbright-Hays host country. [The] little information that is available consists of unpublished reports prepared by the CIEP and annual reports prepared for the Congress by the Advisory Commission on International Educational and Cultural Affairs.[190]

Nevertheless, the Commission has been sufficiently persuaded of the program's effectiveness to describe it as ". . . tremendously successful and . . . an important and significant element of American foreign relations" (sixth annual report to the Congress, 1969). The Commission also expressed concern over cuts which the program had suffered in recent years as part of a general retrenchment occasioned by budget and balance-of-payments problems.

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[187] *Ibid.*, p. 26, footnote 50.

[188] *Ibid.*

[189] So known since passage of the Mutual Educational and Cultural Exchange Act (Public Law 87-256) in September 1961. See further reference to the act in the section below on the *Role of Congress.*

[190] Kasso, op. cit., p. 27. (The CIEP is now called the Council for International Exchange of Scholars and is part of the NAS Commission on Human Resources.)

The author concludes her treatment of the Fulbright-Hays program with some questions:

> Would the quality and effectiveness of scientific participation in the program be improved if: (1) A science advisory apparatus were established in the Bureau of Educational and Cultural Affairs or in the Committee on the Exchange of Persons to provide for better coordination between the requirements of scientific scholarship and diplomatic objectives? (2) the Bureau of Educational and Cultural Affairs undertook more comprehensive information gathering on the program, and sponsored more research and evaluation to improve program operations, continuity, and long-range in-country planning? and (3) field responsibilities were shifted from the cultural affairs officer to an official more familiar with the requirements of educational and scientific exchange, such as an educational officer or science attaché? [191]

Further, in reference to the related problem of attracting qualified and needed personnel in certain technical fields to serve overseas, especially in the less developed countries—she asks:

> In view of the difficulties encountered in finding scientific and technical personnel to serve in the developing countries, would the objectives of the Fulbright-Hays program in these areas be better served if special inducements were made to obtain qualified personnel willing to serve in technical assistance capacities; or if foreign government expectations for technical assistance were satisfied through other U.S. Government programs? [192]

NATIONAL SCIENCE FOUNDATION PROGRAMS [193]

Most of the Nation's programs for sending U.S. nongovernmental scientists abroad are supported by the National Science Foundation and administered either directly by the Foundation or by the National Academy of Sciences with NSF funds. These programs have grown in both number and importance since the Foundation was established in 1950; they are responsible for sending more senior nongovernmental scientific and technical personnel abroad than any other U.S. programs. (In the fiscal year 1970, for example, 886 recipients of NSF travel awards carried out activities in 75 countries for a total of 3,214 workdays; State Department programs sent 293 nongovernmental scientists and technicians to 64 countries for a total of 1,781 workdays.) NSF obligations for international scientific activities totaled about $118 million in the fiscal year 1974; no cost breakout for programs which send nongovernmental technical personnel abroad is available but most NSF international activities involve exchanges.

The purposes of NSF overseas programs are as diverse as their geographic distribution is widespread.

> Some programs support the accumulation of information to advance American science, or science for its own merits; some promote educational advancement of American and foreign scholars; some facilitate international cooperative research programs; and some serve political objectives through bilateral scientific communication. These programs are increasing in number and importance, with respect to U.S. commitments for both science and foreign affairs.[194]

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[191] *Ibid.*, p. 43.

[192] *Ibid.*

[193] This section focuses mainly on the section entitled, "Conclusions: Some Illustrative Questions of Policy" at the end of the 66 page treatment of the subject in the basic study. The reader is referred to the latter (pp. 44-109) for details of the varied NSF exchange programs themselves.

[194] Knezo, op. cit., p. 107.

Congress did not give the Foundation explicit authority to carry out foreign and international scientific activities for their own merits until 1968. Therefore most NSF programs were justified in terms of their contribution to U.S. domestic science. Foreign exchange activities are scattered throughout NSF divisions; the Foundation established an Office for Foreign and International Science in 1955, but that office even today has relatively little responsibility for overseas science programs. These circumstances probably account for the seeming absence of clear-cut Foundation policies and internal procedures providing for coordinated administration of the international programs.

Fragmentation of NSF activities and lack of adequate reporting procedures make difficult the evaluation of Foundation programs. Apparently out of deference to scholarly sensitivities, the Foundation has not required grantees in most programs to report on their international or foreign activities or to make suggestions for improving the programs. "Only in fiscal year 1970 did the Foundation begin to attempt to collect data, and then only in perfunctory fashion, on overseas activities undertaken with NSF funds." [195] These factors have,

> . . . kept the Foundation from defining and developing a role as a lead U.S. agency in support of international science and scientific exchange activities. While a number of these programs very probably have advanced the cause of international science and international politics, there is little information on their achievements or impacts. The absence of both data and a mechanism to plan programs on a Foundation-wide basis undermines NSF's responsibility for determining program priorities in both the short- and long-range future. Systematic determination of priorities, both within and among programs, seems to be required since the programs are both increasing and becoming more significant as tools of foreign policy.[196]

An additional problem is that a number of NSF programs suffer from poor participation rates by U.S. scientists. U.S. scientific participation is circumscribed by language barriers and sometimes by insufficient scientific challenge. "It is conceivable that NSF could design programs which would satisfy more easily criteria for U.S. scientific participation and for country planning needed to develop the science infrastructure for developing countries. For example, the Foundation might insist on better evaluation of the experiences of the programs it supports, better reporting, improved in-house evaluation of reports and of program accomplishments and problems, and more attention to requirements for effective performance." [197]

The author concludes the section on the Foundation's exchange programs with some comments and questions which have been partly overtaken by events but appear to remain essentially valid:

> . . . the Foundation's responsibilities for foreign and international science were expanded under terms of President Nixon's Reorganization Plan No. 1, which took effect on July 1, 1973. This action transfers to NSF some Executive Office functions for determining of domestic and foreign science policies and for interagency coordination. It also designates the Foundation's Director as the President's Science Adviser and personal representative for foreign scientific affairs. It is an open question whether the Foundation's organization for foreign and international science can meet the needs imposed by these expanded responsibilities.

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[195] *Ibid.*, p. 108.
[196] *Ibid.*
[197] *Ibid.*

Other specific questions might be asked:

Should the Foundation enlarge its overseas science staff?

Should the Foundation evaluate the merits of delegating to the NAS increasing responsibilities in international science?

Should the Foundation improve in-house reporting requirements and coordination of foreign and international activities?

Should the Foundation reestablish the International Science Advisory Committee?

Should the Foundation require more systematic evaluation of its far-flung support activities, especially in examining apparent inadequacies of some bilateral technology-assistance programs?

Should the Foundation provide for more systematic coordination with the activities of the Bureau of International Scientific and Technological Affairs, Department of State (now the Bureau of Oceans and International Environmental and Scientific Affairs)? [198]

THE NAS–NRC INTER-ACADEMY EXCHANGES

"The NAS–NRC exchanges with the Soviet Union and the countries of Eastern Europe illustrate a unique dimension of programs which support nongovernmental scientists abroad. . . ." [199] These politically sensitive programs call for high-caliber nongovernmental scientific participation in planning and execution.

Before 1959, Americans were not permitted to participate in any scientific activities in the Soviet Union. Even today all Government-funded exchanges between the United States and the Soviet Union are conducted under formal, rigidly enforced, official treaties and *quid pro quo* exchange agreements. The first of these was signed in 1959 between the National Academy of Sciences of the United States and the Academy of Sciences of the U.S.S.R.; it has been renewed every 2 years since and now takes the form of an annex to the biennially renewed Cultural Relations Treaty between the two countries. The inter-Academy agreements specify reciprocity in numbers, subjects, and duration of exchanges.

The inter-Academy agreement of 1959 provided for a small 2-year program. Subsequent agreements have gradually expanded the scientific exchange. As the then NAS Foreign Secretary, Dr. Harrison Brown, described the program in the May 1971 Hearings of the House Committee on Science and Astronautics (published as *A General Review of International Cooperation in Science and Space*):

> The inter-Academy exchange commenced with provision for 44 scientists of each country to visit the other for a total of 70 months over a period of 2 years, an extremely modest beginning which stressed short visits of 1 month. In 1962, when the program was renegotiated, the NAS took the initiative to adjust the balance away from the short survey visits in the direction of the longer research visits, for which Americans at least took their families along to participate in the new experience. In 1962 a new pattern was established which has continued more or less up to the present: 30 lecture-survey visits of 1 month; 26 research visits totalling 160 months for the biennium, with more emphasis placed on the longer research visits.[200]

The 1970–71 inter-Academy agreement made provision for the two Governments to facilitate exchanges of professors to lecture in the natural, technical, and social sciences and the humanities. The 1972–73 agreement expanded the permissible volume of exchange to 190 man-months on each side. Terms of the latter agreement may be summarized as follows:

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[198] *Ibid.*, p. 109.
[199] *Ibid.*, p. 4.
[200] *Ibid.*, p. 119.

1. *Number and duration of exchanges.*—a. Exchanges of 12 prominent scientists, at least half of them to be members of the respective Academy, for periods up to 1 month to lecture, conduct seminars, or familiarize themselves with scientific research;

b. Exchanges of a maximum of 14 scientists from each country, for 1 month visits for the familiarization with research;

c. Exchanges of a maximum of 35 scientists, with total visits not to exceed 190 man-months, to conduct scientific research or to pursue advanced study; visits to last from 3-10 months;

2. *Nomination and selection.*—Nominees to be approved by both Academies. Scientists are evaluated on education, professional employment, scientific specialization, publications, location of proposed visit, knowledge of foreign language, and title of lectures;

3. *Additional exchanges.*—Which permit revisions of the agreed upon terms as well as provision for visits for scientific conferences;

4. *Program review.*—Both Academies are to exchange small delegations each year to review the inter-Academy exchange program "at the policy level;"

5. *Financing and administrative arrangements.*—The sending Academy is to provide round trip transportation and salaries for its scientists; the receiving Academy to provide in-country transportation costs, living quarters, medical expenses, special allowances, and reimbursement for research equipment expenses.[201]

As the figures indicate, the inter-Academy program is a modest one. The total number of American scientists visiting the Soviet Union between 1959 and 1970 under the agreements was 224, for a total time of 666 months; corresponding figures for Soviet scientists visiting the United States were 234 and 696 months. The average cost of a visit by a U.S. scientist was $7,300.

Inter-Academy scientific exchange programs with East European countries are carried out, in general, not through formal intergovernmental agreements but under memoranda of understanding between national academies. This statement applies to agreements with Czechoslovakia, Poland, and Yugoslavia (all concluded in 1966), and Bulgaria (concluded in 1970). An Academy-to-Academy exchange agreement with Romania was arranged in 1964 on the basis of an intergovernmental exchange of notes.

The program of inter-Academy exchanges with East European countries has been very small, totaling, for the 5-year period 1966-70, only 106 East European scientists visiting the United States (33 from Czechoslovakia, 44 from Poland, 45 from Romania, and 19 from Yugoslavia) and 147 U.S. scientists visiting Eastern Europe.

Despite the need for close attention to the details of arrangements in the scientific exchanges with the Soviet Union and East European countries occasioned by the political context, there is lacking in these programs—as in the Fulbright and NSF exchanges—the kind of information in depth which would permit assessment of experiences, problems, and achievements:

> Evaluation is . . . hampered by the absence of reliable and public information on annual activities. The NSF, which funds these programs, is under statutory obligation to report annually to the Congress in authorization and appropriations hearings and also in annual reports of grants awarded. However, the Foundation gives superficial details of the Soviet and Eastern European exchanges; gross financial data; and some descriptive material citing especially meritorious activities. It has not made a systematic attempt to provide the Congress with a detailed summary of activities and problems culled from materials available from the National Academy of Sciences.[202]

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[201] *Ibid.*, pp. 119-120.
[202] *Ibid.*, pp. 115-116.

The Academy is a quasi-public scientific advisory group chartered by Congress to provide advice to the Government on matters involving science, technology, research, and development. It is not subject to annual authorization and appropriations oversight. It does prepare annual reports for Congress, but these are generally published several years after the fact.

Role of Congress

Post-World War II scientific exchange programs have attracted sustained congressional interest and frequent legislative activity, but have not been attended by oversight and evaluation efforts of real depth and persistence.

Some of the important dates in that history are the following:

FULBRIGHT-HAYS PROGRAM

1946—Adoption of the aforementioned Fulbright amendment to the Surplus Property Act of 1944, authorizing an exchange of scholars to be financed by foreign currencies derived from the sale of surplus war materials abroad.

1948—Passage, after long and heated debate on the relationship of educational exchange to foreign policy, of the U.S. Information and Education (Smith-Mundt) Act, Public Law 80–402.[203] The provisions of this act reflected a desire to maintain a relative independence of educational and cultural affairs from foreign policy. The foreign policy purpose was served by establishing an information service separate from educational activities. The latter, under the Fulbright program, were strengthened by:

(1) authorizing some educational exchange in countries other than those whose governments had signed educational exchange agreements;

(2) enabling Fulbright scholars to receive some supplementary dollar support;

(3) requiring the State Department to use private organizations wherever possible in carrying out the operations and objectives of the program;

(4) authorizing the inclusion of technical assistance activities under the concept of educational interchange of persons, knowledge, and skills authorized by the program; and

(5) further expanding the concept of educational exchange by authorizing the Secretary of State to support the exchange of educational materials, and to extend grants to American-sponsored schools, libraries, private universities, and other organizations to further the aims of the educational and cultural exchange programs.

The act also created the Presidentially appointed U.S. Advisory Commission on Educational Exchange to appraise the effectiveness of the exchange program semiannually and recommend legislative improvement.

1954—Adoption of an amendment (Public Law 83–480) to the Agricultural Trade Development and Assistance Act of 1954, authorizing U.S.-owned foreign currencies from any source, including the sale of U.S. agricultural commodities abroad, to finance educational exchange. The amendment was proposed by Senator Fulbright when the earlier source of funds—sales of surplus war materiel—began to dry up.

1961—Passage of the Fulbright-Hays act (Mutual Educational and Cultural Exchange Act, Public Law 87–256). This was the original authorizing legislation for present educational and cultural exchange programs. It had wide support in the Congress and was adopted in the House 378 to 32, in the Senate 79 to 5. Among other things, the Fulbright-Hays act:

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[203] *Ibid.*, p. 21.

> —made financial arrangements more flexible to support long-range binational planning and financing by permitting reservation of foreign currencies in advance, dollar financing, interagency transfer of funds for programs, and the extension of support to individuals as well as to institutions;
>
> —authorized private sector evaluation research on educational and cultural exchange;
>
> —expanded the program to include U.S. and foreign participation in international educational and scientific meetings and created additional centers of technical and cultural interchange, such as the East-West Center in Hawaii; and
>
> —refined and strengthened binational program planning and the role of private advisory groups in administering the program.[204]

NSF PROGRAMS

1950—Establishment of the NSF by the National Science Foundation Act of 1950; NSF given limited authority for international science activities, but only to support U.S. domestic science.

1958—NSF authority to foster interchange of information among U.S. and foreign scientists broadened by passage of the National Defense Education Act of 1958.

1959—NSF enabling legislation amended to read "international science activities" instead of the more limited "international science research activities."

Mid-1960s—Congress "gave critical attention to further expansion of the agency's mandate. Three areas received major concern: social science research, applied research, and international science." [205]

1968—Legislation proposed by Science, Research, and Development Subcommittee Chairman Emilio Q. Daddario enacted, expanding the Foundation's mandate to "initiate and support specific scientific activities in connection with matters relating to international cooperation," on their own merits and not just in relation to domestic science. The NSF amendments of 1968 also expanded the jurisdiction of the Subcommittee on Science, Research, and Development to authorize appropriations for the NSF.

1971—NSF requested by House Committee on Science and Astronautics to furnish Congress with a line item budget. In response, NSF began to use a consistent format for reporting international science activities.

NAS-NRC PROGRAMS

The area of congressional oversight responsibility includes the National Science Foundation but only indirectly, through the NSF, that of the National Academy of Sciences-National Research Council. Apart from references to the wide-ranging hearings of the House Committee on Science and Astronautics in May 1971 on *A General Review of International Cooperation in Science and Space*, mention in the study of congressional interest in the inter-Academy exchanges is limited to references to NSF authorization and appropriations actions and to a footnote (page 111) on the 1972 accord with the U.S.S.R. The accord had been reviewed by the Subcommittee on International Science and Space of the House Committee on Science and Astronautics in hearings on *U.S.-U.S.S.R. Cooperative Agreements* and in a subcommittee report on the same subject (August 1972).

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[204] *Ibid.*, p. 23.
[205] *Ibid.*, p. 47.

It is noted repeatedly throughout the study that the three major exchange programs are deficient in arrangements for program analysis, evaluation of effectiveness, and related factual reporting. As the author observes of one of the three:

> Throughout its history the Fulbright-Hays program has lacked both appropriate data collection and evaluation procedures; consequently there has been insufficient attention to systematic improvement of planning and program operations. Scientific exchanges constituting more than half of the Fulbright-Hays program, apparently have not received indepth evaluation by agencies administering the program.[206]

With the exception of a detailed review that Congress made of exchange programs when it was considering the Fulbright-Hays legislation in 1961, congressional consideration of these programs has been limited essentially to annual Appropriations Committee review of the State Department's mutual educational and cultural exchange program. A search of congressional hearings and literature for the period 1960–70 yielded nothing which focused especially on the Fulbright-Hays program.[207]

Status of the Issue; Prospects and Options

A second major problem in the administration of exchange programs, along with reporting and evaluation, is that of coordinated program planning. It was noted earlier that two agencies have had some responsibility for trying to coordinate the U.S. Government's international science policies and programs: the International Committee of the Federal Council for Science and Technology (IC, FCST—subsequently transferred to the aegis of the Department of State), and the Bureau of International and Scientific Affairs (SCI), Department of State[208] (now the Bureau of Oceans and International Environmental and Scientific Affairs—OES).

The author comments that although no in-depth evaluation of SCI and its work is available, "Several critiques indicate that because of political and organizational constraints, SCI has been less than effective in coordinating U.S. science policies abroad." [209] According to one widely traveled U.S. scientist, Roger Revelle, the cause of this shortcoming is that the Department of State is constrained from taking the initiative in designing policies for science and technology, Revelle states that, "one reason for this deficiency may be a feeling among the leaders of the Department that the changes brought about by [scientific] developments will be slow to take effect and can be [managed] as they emerge by conventional diplomatic means." Another critic, the Organization for Economic Co-operation and Development, "faults the Bureau with concern for minor tasks and deferring responsibility for guiding major international scientific and technological policies and programs to the White House. . . ." [210]

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[206] *Ibid.*, pp. 26–27.

[207] *Ibid.*, p. 26, footnote 58.

[208] The point being made by the author of the present study is reinforced by the observation in a later (June 1975) study in this series, *Science and Technology in the Department of State*, that ". . . pending action on the Presidential science policy system, the current situation is that aspects of international science and technology policy, in the upper reaches of policymaking are spread among:

—The Bureau of Oceans and International Environmental and Scientific Affairs;
—The State Department Policy Planning Staff;
—The immediate staff of the Secretary of State;
—The National Security Council, and the Under Secretaries Committee;
—The Director of NSF and the Science and Technology Planning Office; and
—Council on International Economic Policy.

Precisely how policy initiatives can evolve out of this rather complex congeries of high level institutions is not clear." (U.S. Congress, House, Committee on International Relations, *Science and Technology in the Department of State*, a study in the series on Science, Technology, and American Diplomacy prepared for the Subcommittee on International Security and Scientific Affairs by Franklin P. Huddle, senior specialist in science and technology, Congressional Research Service, Library of Congress, Washington, D.C., U.S. Govt. Print. Off., June 1975, 180 pp. (Committee print.) p. 174.

[209] Knezo, *op. cit.*, p. 154.

FCST EFFORTS TO IMPROVE MANAGEMENT OF U.S. EXCHANGE PROGRAMS

FCST, composed of representatives of all relevant Government agencies, was established in 1959 ". . . to promote closer cooperation among Federal agencies, . . . to improve planning and management in science and technology, and to advise and assist the President regarding Federal programs affecting more than one agency. The International Committee of the FCST was created, also in 1959, to recommend "measures to promote and enhance U.S. participation in and support for international scientific activities compatible with our foreign policy." [211] The Committee made several abortive attempts to improve and coordinate governmental activities relating to foreign and international exchanges. For example, in 1961, at the request of Presidential science adviser George Kistiakowsky, it undertook a review of the international scientific activities of all Federal agencies which resulted in a report, *International Scientific and Technological Activities*, which called on the NSF to provide better information on exchange activities. The Foundation never responded to the recommendation. In 1968 the IC, FCST, prepared, in collaboration with the Bureau of Educational and Cultural Affairs, a set of guidelines which contained the recommendation that "each agency concerned provide the IC, FCST, with an annual report on its exchange programs and the steps which are consistent with these Guidelines." [212] The agencies failed to respond and the effort was dropped.

The IC, FCST, made another attempt beginning in 1970 to catalog U.S. Government relationships in international science and technology. The committee requested agencies to supply it with:

> (a) Brief description of agency's international scientific programs and projects;
>
> (b) Their relation to past size during the 1960s and to the vigor, need and demand for programs;
>
> (c) . . . Missed opportunities which might have been developed under more favorable circumstances;
>
> (d) Legislative authorities and restrictions within which programs-projects are carried forward;
>
> (e) The agency [view of the] programs' utility. Identification of specific instances in which the cooperative programs with other nations have resulted in savings of time or money or in other direct benefits to the U.S.; and
>
> (f) Observations which may serve to clarify the data given.[213]

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[210] *Ibid.*, p. 154.
[211] *Ibid.*, p. 155.
[212] *Ibid.*, p. 158.
[213] *Ibid.*, p. 159.

The review was never completed. According to the IC, FCST, "preparation of the report has posed far more difficulties than had been foreseen. Among the difficulties . . . [was] the lack of comparability between the submissions of various agencies. . . ."

At the beginning of this commentary on *Scientists Abroad* it was suggested that an even more important problem than those of the direction, coordination, and evaluation of technical exchange programs might be the antecedent problem of providing a coherent policy context. An example of such a context with respect to U.S. scientific programs in Europe is provided by Victor Basiuk, writing in 1972:

> Present American scientific and technological policy . . . is largely *ad hoc* and unfocused. There is concentration on individual countries and programs, on targets of opportunity. But there is no overall view which would take into consideration the nature and requirements of upcoming technologies, especially their large scale and high cost. As a result, the United States has been drifting in the direction of bilateral cooperation with European nations. . . . This course is not adequate. To meet the requirements of the large-scale technology of the future and of the immense costs associated with it, Western Europe must develop a large market and cohesive internal institution. Compartmentalized bilateral relationships between the United States and individual Western European nations bypass this objective.[214]

Basiuk concludes that the absence of multilateral cooperative scientific relationships with Europe imperils transatlantic security:

> If Washington does not soon develop a concerted science and technology policy, it is foreclosing options for the late 1970s and early 1980s in a way that almost guarantees insecurity in Europe. The enormous complexity of the task is no excuse for not addressing it. Small-scale, bilateral cooperation may postpone the peril, but it cannot in the end avert it.[215]

In a statement to the House Committee on Science and Astronautics in January 1971, Chairman Daddario of the Subcommittee on Science, Research, and Development addressed the same theme, but more broadly:

> . . . It has become evident that the concept of sovereignty and the traditional means of conducting relations between nations are no longer sufficient. The reason for this is that technology has largely changed the world, and in doing so it has rendered the old framework very vulnerable. Today, we are witnessing an increasingly rapid compression of both time and space. . . . This has led to the contemporary paradox whereby the human race is simultaneously becoming more unified and more fragmented. We now seem to have a dichotomy on our hands—either lasting cooperation or complete political dissolution—the potential for either being greater than in any previous period in human history.[216]

Daddario suggested that the development of individual national science policies is no longer enough to meet today's foreign policy and—a consensus must be reached on developing integrated policies for a technologically interdependent world:

> . . . Before there will be any real global cooperation, there must be far greater consensus on its purposes. What are these? Is it to enhance material well-being and intellectual development? Is it economic growth or a massive educational effort? Is it limited arms control or an international peace-keeping mechanism? Is it expanded medical health care or more adequate housing? And what are the priorities? . . . How do we reach some balance between near-term localized problems and long-term global problems? [217]

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[214] *Ibid.*, p. 161.
[215] *Ibid.*, p. 162.
[216] *Ibid.*
[217] *Ibid.*

Author's Reassessment as of January 1976

Author Genevieve J. Knezo adds the following comments on her *Examination of Major Programs for Nongovernmental Scientific Exchange:*

—That exchange programs are becoming an increasingly important tool of U.S. foreign policy is evidenced by the recent proliferation of bilateral scientific and technical agreements signed by the United States. Most of these provide almost exclusively for exchange. These developments foreshadow the future importance of related considerations: an enhanced desire by other nations to share in the benefits of U.S. scientific and technical excellence, an ever-accelerating requirement for the United States to recognize and share in the technical knowledge and breakthroughs of its technologically advanced neighbors, and the enlargement of the scope and objectives of foreign policy to include consideration of more substantive scientific and technical issues.

CONTINUING NEED FOR BETTER DIRECTION AND COORDINATION

—It seems abundantly clear from the study that if exchange programs are to meet more effectively the requirements of a world increasingly dependent upon science and technology, better direction, review, and coordination of exchange programs will be needed. Attention is also drawn in the study to the need to consider the merits of a multilateral alternative for some programs. It was also noted that complementing agencies do not always tell the Congress about many of the deficiencies of these programs.

—The issue of the need for better formulation and coordination of foreign policy with a scientific and technical content was raised in the National Academy of Sciences study, *Science and Technology in Presidential Policymaking*, pp. 43–45.[218] The authors of the report recommended a strong role for the proposed Presidential Council for Science and Technology in ". . . areas of foreign policy strongly affected by scientific and technical considerations."

—The number of science and technology agreements with other nations is increasing. Legislative interest in overseeing these agreements and their content similarly is increasing. See: "Joint Commissions with Foreign Countries," statement of the Hon. Lee H. Hamilton, *Congressional Record*, January 23, 1975: E146–E148.

—Rep. Zablocki has proposed creation of a Joint Committee on National Security to reassert the legislative role and responsibility in the conduct of foreign policy. (See *Congressional Record*, January 14, 1975: H39–H40.)

—Several issues which were raised in the study are now being considered by the agencies involved. These include:

—the pros and cons of USIA field administration and oversight, as contrasted with educational affairs officer oversight, of field operations of the Fulbright-Hays program. A study is being done by the U.S. Advisory Commission on International Educational and Cultural Affairs.[219]

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[218] National Academy of Sciences, *Science and Technology in Presidential Policymaking: A Proposal*, Report of the Ad Hoc Committee on Science and Technology, Washington, D.C., June 1974, 56 pp. (This study was prepared in part for use by Congress in its consideration of reestablishing an executive branch science advisory office.)

—two separate studies in areas which warrant review for scientific and technical educational exchange programs, commissioned by the Bureau of Educational and Cultural Affairs: (1) "An investigation of the consequences of international educational exchange," and (2) "Mental Health in international educational exchanges: a study of coping behavior in a cultural environment." [220]

—the merits of team exchanges and multilateral vehicles for exchange for the Fulbright-Hays program. Efforts are now underway by the Board of Foreign Scholarships to examine this issue.

—I believe in retrospect that the report gave a valid and balanced perspective to the exchanges. However, if time had permitted, I should have attempted a more detailed analysis of the impacts of the programs or their contributions to the advancement of science and technology. Also, I should like to have assessed the quality of technical information transferred in relation to the level of development of the science and technology infrastructure of a recipient country. An attempt might also have been made to assess these programs in light of the origins, purposes, and activities of programs which send governmental staff scientists abroad under exchange programs or bilateral or multilateral agreements.

—There seems to be little attention in Congress now to reviewing and improving federally funded nongovernmental scientific and technical exchange programs. In the course of implementing new budget review and oversight responsibilities Congress might give more attention to this topic. The General Accounting Office and the House Committee on Science and Technology have recently conducted oversight reviews of the objectives and content of Soviet-American cooperative agreements, including those for science and technology.[221]

Some Illustrative Questions

The author has posed many questions in the study itself; some have been incorporated in the preceding text of this commentary. Others follow:

In the currently emerging science policy structure at the national level is adequate provision being made for coordinated planning and direction of exchange programs in relation to foreign policy goals and priorities? For follow-through of evaluation efforts, with reporting of findings to the President and Congress?

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[219] The study was described by W. E. Weld, Jr., staff director, in a letter to the author of Mar. 3, 1975.

[220] These studies are described in "Measuring the impact of academic exchange," *FAR Horizons*, v. 7, no. 2, Spring 1974: 5–7.

[221] The resulting GAO report is: U.S. General Accounting Office. *A Progress Report on United States-Soviet Union Cooperative Programs.* A report to Congress, Washington, U.S. General Accounting Office, 1975. 98 p. The House Committee review is summarized in: U.S. Congress. House. Committee on Science and Technology. Subcommittee on Domestic and International Scientific Planning and Analysis. *Background Materials on U.S.-U.S.S.R. Cooperative Agreements in Science and Technology.* Report prepared by Claire Riley Geier, of the Science Policy Research Division, Congressional Research Service, Library of Congress. 94th Congress, First session, December 1975. Washington, D.C., U.S. Government Printing Office, 1975. 98. p.

Is the emphasis in U.S. programs for exchange of technical personnel too exclusively bilateral? Should multilateral alternatives be pursued? Through what channels: in existing international and regional organizations, ad hoc groupings of countries with related interests, or a new international mechanism established for the purpose?

In its examination of the three major exchange programs the study frequently touches on the theme that, "If they are to meet more effectively requirements of a world increasingly dependent on science and technology, and especially if they are to help significantly in reconciling the often incompatible requirements of science and diplomacy, better direction, coordination and review will be needed." [222] What, in the light of failures to date, will it take to meet this need? How can it be met without resort to massive bureaucratic methods?

How incompatible, in fact, are the requirements of science and diplomacy? Can competent scientists and technologists serve forthright national purposes—assuming that they do not become involved in the immediacies of international politics—without compromising scientific integrity? Is the answer to this question partly a matter of the world view of the President and his key science advisers, and of the professional qualifications of the latter?

Is it perhaps the diplomats, with their predilection for seat-of-the-pants decisionmaking and their traditional aversion to research, rather than the scientists and technologists, with their disciplined acceptance of the systems approach and meticulous documentation, who are responsible for persistent failures in reporting, review, and evaluation? In developing reporting and evaluation systems for the various exchange programs, would it be useful to seek the recommendations of teams of representative scientists and technologists on ways to exploit (a) the disciplined habits of scientists and technologists, (b) the organizational know-how of most technologists, and (c) the sensitivity as to political non-involvement of many scientists?

One observer with outstanding qualifications for judging the success or failure of scientific exchanges—Dr. Harrison Brown, longtime Foreign Secretary of the National Academy of Sciences who retired from that post in 1974—has said of the U.S.-Soviet exchanges:

> . . . As a result of contacts between Soviet scientists and American scientists there have been some rather extraordinary foreign policy changes. I have seen attitudes of the scientists of one country change enormously as a result of these contacts. I have seen people come to the United States who had preconceived concepts . . . which were dramatically changed during their visit. I would say that if it had not been for these contacts we would not today have a Test Ban Treaty . . . nor would we be as far along the path toward the eventual signing of the Nonproliferation Treaty; nor would we have the SALT talks. . . .[223]

Are broad evaluations like this by knowledgeable persons perhaps more informative than elaborate built-in systems of detailed reporting and analysis? If systematically conducted, could they substitute for the latter? Would a combination of the two evaluation methods be preferable to reliance on either one alone?

How important is it that the American public be informed about the various exchange programs—their purposes, scope, problems, and accomplishments? Should the executive branch make more of an effort to disseminate information about them (presumably in the form of human interest stories as well as statistics)? Should Congress on a continuous or periodic basis publicize the programs and call attention to their role in furthering U.S. foreign policy goals?

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[222] Knezo, *Scientists Abroad*, p. 149.
[223] *Ibid.*, p. 120.

ISSUE FIVE—BRAIN DRAIN: A STUDY OF THE PERSISTENT ISSUE OF INTERNATIONAL SCIENTIFIC MOBILITY[224]

Statement of the Issue

December 1975: "The loss of domestic intellectuals and academically trained individuals is becoming a serious problem for a number of African governments. Despite the often catastrophic shortage of skilled personnel in their homelands, a large number of African students studying at West European and American countries choose to remain abroad after graduation.

"The number of Nigerian university graduates who have remained in the United States, for example, is estimated at 8,000. . . ."[225]

Items like this have been common in the world press during the past decade. They illustrate a problem which has been critical for many of the less-developed countries (LDCs) of Africa, Latin America, and—most of all—Asia. Paradoxically, however, that problem has virtually been dropped from the agenda of the governments of the developed countries gaining the skilled personnel; in those countries (though not in the losing countries) it has almost lost official and political visibility. The issue has both substantive and procedural importance. The substantive factor may be stated about as follows: The "have" countries attract educated talent away from the "have-not" countries, thereby hampering the development process of the latter and tending to offset the development aid which the latter receive from them. The procedural might be put in question form: How is it possible for a problem or issue which exists, and which has been the subject of emotional debates in major and minor world forums (the U.S. Congress, the United Nations, the British Parliament, the parliamentary organs of dozens of other developed and developing countries), to drop out of sight before any significant remedial action has been taken? What is missing in the arrangements by which responsible governments of powerful countries recognize problems, keep them under study, and when they are sufficiently understood, take corrective action? Why do the developed countries permit problems with important consequences for foreign policy and international relations to be ignored?

Importance of the Issue

The brain drain problem "has special relevance for the modern scientific-technological age . . . [Situated] at the juncture of science, technology, and American diplomacy, [it] reveals and is symptomatic of a deeper and far more serious problem: that of this Nation's relations with the LDCs and its foreign policy stand respecting the larger issue of international development as related to U.S. economic health and national security":[226]

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[224] U.S. Congress, House, Committee on Foreign Affairs, "*Brain Drain. A Study of the Persistent Issue of International Scientific Mobility*," in the series on Science, Technology, and American Diplomacy; prepared for the Subcommittee on National Security Policy and Scientific Developments by Dr. Joseph G. Whelan, senior specialist in international affairs, Congressional Research Service, Library of Congress, Washington, D.C., U.S. Government Printing Office, September 1974, 272 pages. (Committee print.)

[225] Peter Seidlitz, "The African Brain Drain," *Swiss Review of World Affairs*, December 1975, p. 11.

> Brain drain is a symptom of underdevelopment; solutions lie largely in the realm of international development; the most essential mechanism is nation-building through science and technology. As a foreign policy problem, therefore, brain drain raises the basic question of this Nation's stance toward international development.
>
> Brain drain is essentially a foreign policy problem of low visibility; but even so, it is a testing ground for the vitality of a policy of much larger significance, namely, the Nation's commitment to development. Solutions for brain drain may be the primary responsibility of the LDCs, particularly the task of institution-building and establishing an infrastructure of science and technology as the basis for modernization, but solutions can neither be devised nor development goals achieved without assistance from the advanced countries like the United States.[227]

In parallel with the American humanitarian tradition of helping others to help themselves, it is necessary to comprehend—the author continues—that political realism alone requires a continuing U.S. commitment to development:

> It would seem beyond dispute that the LDCs, long the cockpit of international tension and conflict in which the United States has not been able to stand aside uninvolved, hold the potentialities for even deeper and more dangerous involvement. War in South and Southeast Asia, recurring crises in the Middle East, famine and tribal strife in Africa, are only recent illustrations of the problems that have been shaking the foundations of this volatile, troubled Third World. Economic development, it is argued, offers perhaps the best prospects for peace and stability. Thus the increasingly compelling requirements of political interdependence bind all nations, advanced and underdeveloped, in a common search for peace through economic development.
>
> American dependence on mineral resources largely under the control of the LDCs, as development specialists are quick to indicate, points to a new vulnerability for the United States. Awareness of this problem comes at the height of the current energy crisis and suggests what may be a scenario for things to come with growing cartelization of world mineral resources and growing consciousness of increased leverage among the LDCs to be used against the advanced industrial nations. Reasons of self-interest appear to warrant a reappraisal of the Nation's posture towards the LDCs and the affirmation of a policy of interdependence.[228]

To summarize: ". . . in the judgment of students of development and brain drain, one of the major challenges to mankind remains the challenge of finding ways to put the LDCs on a course leading to a self-reinforcing upward spiral of social and economic progress." The importance of the brain drain issue is that resolving it for any given LDC or group of LDCs would be one of the critical ways of putting the countries concerned on such a course—and to that extent contributing to the ultimate diplomatic goal of "a world in balance, with social and economic opportunity within the grasp of all inhabitants and a sense of hope in all nations."[229]

How the Issue Developed

The international migration of talent is not a new historical phenomenon.[230] Of primary concern in the context of the Science, Technology, and American Diplomacy study series, however, is its current manifestation as the "brain drain" from countries in need of educated talent (the less developed countries, or LDCs) to those already rich in such talent—especially the United States.

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[226] Whelan, *Brain Drain*, p. 208.

[227] *Ibid.*, p. 270.

[228] *Ibid.*, pp. 270-271.

[229] *Ibid.*, p. 272.

[230] For an account of the migrations of talent from ancient times until the recent past, including their role in the spread of science and technology throughout the ages and in the development of Colonial America, see *ibid.*, "Brain Drain in Historical Perspective," pp. 18-30.

As a contemporary international problem, the study observes, the brain drain phenomenon "has its roots in the profound changes in the political structure of international relations that have been brought about as a consequence of World War II. These changes were to have a marked bearing on patterns of migration in the postwar era." [231]

THE HEIGHTENED HUMAN MOBILITY OF MODERN TIMES

Human mobility has been a salient characteristic of this new era. Much of it was in the form of forced migrations. "Programs of repatriation or settlement of those dislocated by World War II, and population transfers resulting from the creation of newly independent states or the outbreak of wars, involved millions of people":

> Migrations on this vast scale tended to overshadow the normal free movement of peoples. The turbulence of the era is seen in the statistics. After World War II, 18,000,000 people were uprooted by the partition of India and Pakistan; West Germany accepted 12,000,000 refugees dislocated during the war; Japan resettled 6,300,000; South Korea absorbed 4,000,000 and Hong Kong 1,300,000. In Israel, 1,000,000 Jews found refuge in a new homeland, while more than 1,000,000 Palestinian Arabs fled the country. Ultimately, the International Refugee Organization and Intergovernmental Committee for European Migration settled 1,300,000 refugees overseas. These statistics do not include the movement of people in the Soviet and Chinese areas, but even this limited survey produces a total of 45,000,000 forced emigrants. Thus in one decade the number of people compelled to move across frontiers was equal to the entire movement of free emigrants across the Atlantic in the century ending in 1913.[232]

These forced migrations were followed by accelerating flows of free emigrants, smaller in number and different in kind. Conditioning and characterizing the free emigration were an evolving internationalism, the process of decolonization, and the reordering of priorities in U.S. immigration by establishment of the criterion of quality rather than quantity.

This new internationalism, the author observes, was characterized in the political sphere partly by the establishment of the United Nations and its affiliated organizations which gave organizational structure to world politics, and partly by the growing tendency of peoples everywhere to think and act in a global context which made migration less formidable psychologically.

In the economic sphere, the trend toward closer integration of the world economy has a direct effect on the migration of talent. The market for educated professional people has become increasingly international as a result of such developments as the reduction of barriers to international trade, increasing integration of national capital markets of the advanced countries into a world capital market, the growth of direct foreign investment in modern technology from country to country, and the modernization of traditional class- and status-oriented societies.

"Contributing to the integration of the world economy which produced this special effect on emigration are two main forces in the modern world . . .: the worldwide spread of the Industrial Revolution, and the movement of advanced Western societies into the post-industrial era. Both forces have created special needs, particularly a need for talent." Affecting this need have been such post-World War II phenomena as:

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[231] *Ibid.*, p. 31.
[232] *Ibid.*

> —The great upsurge in world education, augmenting substantially the talent market;
>
> —The movement, internally as well as externally, towards urban and metropolitan centers which industrialization has fed. . . .
>
> —Far-reaching improvements in transportation and communications, facilitating mobility and making information on job opportunities readily available;
>
> —The standardization of professional training, easing lateral movement across national boundaries; and
>
> —Official encouragement of preference provisions, work permits, and other provisions in state-regulated immigration laws designed to attract talent from this new world market.[233]

IMPACT OF DECOLONIZATION ON BRAIN DRAIN

The process of decolonization has, by ironic mischance, had negative consequences for the brain drain problem. In its most serious manifestations, the problem largely involves emigration from the former colonial areas of Asia and Africa.

> By virtue of the former colonial-imperial link the emigrant moves into what he believes to be familiar circles. This familiarity eases the burden of transition between two essentially different cultures. The imperial tradition may also engender a belief that by migrating to the imperial center, the former colonial is moving up into a superior and more exciting culture. The attraction is often so alluring that the former colonial remains, to the loss of his developing native country.[234]

This form of brain drain arises out of what tend to be self-defeating contradictions in policies of the erstwhile imperial powers and other advantaged countries which seek to assist the development process in the disadvantaged former colonies through programs of foreign aid. Such efforts, the study notes, are often offset by the movement of "human capital" in the opposite direction.

> Concern for this problem has increased with a growing awareness that development cannot be effectively stimulated simply by the flow of money to the LDCs and that an equally vital role must be played by local people with skills and expertise to carry out development programs. The United States become involved in this problem in that former colonials immigrate to the United States through the former imperial centers in Europe: they come directly from their native country; and the United States has been a long time advocate and practitioner of foreign aid as a means of development. . . .
>
> What makes this matter particularly important for international relations today is that the LDCs constitute a vast configuration of political power: they have a voice; and they make known their complaints. No longer are they willing to remain silent while their interests are being ignored.[235]

EFFECTS OF CHANGES IN IMMIGRATION PRIORITIES

The effects of the reordering of immigration priorities on the brain drain problem, especially in relation to the LDCs, have been far-reaching. New criteria of quality and selectivity invited emigration of the professionals, the intellectuals, and the technically skilled. Along with the lowering of racial restrictions in the economically advanced countries, these new criteria had a special appeal for the LDCs.

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[233] *Ibid.*, pp. 32-33.
[234] *Ibid.*, p. 33.
[235] *Ibid.*, p. 34.

"Paradoxically, attempts to right an injustice of discriminatory quota systems created a new and unintended problem: a powerful incentive was now given to the professionals in the LDCs to emigrate and thus deprive their developing countries of much needed professional manpower":

> A survey of professional emigration from Iran, Pakistan, and Turkey showed that 50 percent of all their scientists trained abroad did not return home. Another showed that Argentina lost 5,000 engineers through emigration in recent years. And 58 percent of those emigrating from the United Arab Republic (U.A.R.) were scientists; 70 percent held Ph. D. degrees.[236]

The most serious professional manpower drain is represented by nonreturning students:

> According to a United Nations manpower report, the number of foreign students studying in advanced countries has shown a "steep annual increase." In 1967, it said, 100,262 foreign students were enrolled in American institutions of higher learning; an estimated 70 percent were from the LDCs. According to estimates by Prof. Robert Myers of the University of Chicago, described by Dr. John C. Shearer, Director, Manpower Research and Training Center at Oklahoma State University, as the "best overall measures of the foreign student brain drain," the overall nonreturn rate is between 15 and 25 percent rather than the semiofficial 8 to 10 percent frequently quoted. Leakage among nonreturning doctoral students has ranged from a high of 90 percent for Taiwan to a low of 14 percent for Pakistan.[237]

Another aspect of the shift in immigration criteria was competition among the developed countries for professional and skilled manpower. This competition was especially keen in the medical, engineering, and scientific professions. As Canada's Minister of Manpower and Immigration put it: "The high cost of training professional and skilled people . . . is a measure of the benefit derived [by] Canada. . . . Other countries are in competition with us for immigrants." [238]

Still another effect of the change in criteria has been to make skilled manpower more mobile and unskilled manpower less so.

In the international debates of the mid-1960s, the United States and its economic policies and practices were singled out as a main cause of brain drain from the developing countries. However, the author comments, later studies revealed new evidence suggesting what Ambassador Nuri Eren of Turkey has called "universal culpability"—

> All the great industrial powers of the West were shown to have been acting as centers of attraction for scientists, engineers, [and] doctors . . . not only the United States but Great Britain, France, Germany, Canada, and Australia. In varying degrees these countries were the principal gainers in the brain drain, while such LDCs as India, Iran, Turkey, Pakistan, Philippine Islands, Taiwan, Korea, Colombia, and Argentina were prominent losers. Thus the LDCs paid part of the price for manpower benefits accrued to the expanding industrial societies of the world.[239]

U.S. Involvement

More than any other country, the United States is a magnet for migrating scientists, engineers, physicians, and other professionals. Dr. Zbigniew Brzezinski of Columbia University, a student of brain drain and of the impact of technology on human affairs, has observed that "America's professional attraction for the global scientific elite is without historic precedent in either scale or scope." [240]

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[236] *Ibid.*, p. 35.
[237] *Ibid.*
[238] *Ibid.*, p. 36.
[239] *Ibid.*, p. 37.
[240] *Ibid.*, p. 49.

MAIN TRENDS IN IMMIGRATION

Two main trends are discernible in the incomplete but still revealing statistics of post-World War II immigration into the United States: a large and rapid increase in the immigration of scientists, engineers, and physicians in general, and an especially steep rise in the immigration of technical workers in the same categories from the LDCs. In 1947, only about 2,400 natural scientists, engineers, physicians, and surgeons came as immigrants to the United States: not more than 400—about a sixth—were from LDCs. By 1968 the numbers were up to about 25,300 and 13,200—more than half—respectively. According to data compiled by Gregory Henderson of the United Nations Institute for Training and Research (UNITAR),[241] the immigration of engineers, scientists, and medical personnel from Taiwan rose from 47 in 1956 to 1,321 in 1967; in the case of India, from 100 to 1,415; and in that of the Philippines, from 90 to 1,066.

A third trend is a relatively greater increase in immigration of personnel in the same categories from the LDCs of Asia as compared with those of Africa and Latin America. More than half of the 7,500 immigrant scientists and engineers of 1970 had last resided in Asia—2,900 of these were from India. Data compiled by the U.S. Immigration and Naturalization Service and analyzed by the National Science Foundation [242] give the following comparative figures for the fiscal year 1972, by country or region of birth (for each area, the first figure represents scientists and engineers together, the second physicians and surgeons): Europe plus Canada—1,887 and 757; Latin America—756 and 523; Middle East—556 and 683; Africa—433 and 259; and Asia—7,599 and 4,875.

THE GROWING INFLUX OF FOREIGN MEDICAL GRADUATES

A fourth trend is the large and growing percentage of physicians and surgeons within this group of talented immigrants—with emphasis, again, on the LDCs as source. While in recent years there has been some leveling off in immigration of scientists and engineers—partly because of a decline in the aerospace industry but largely, it would appear, from a 1972 revision of regulations by the Department of Labor to require certification for employment of scientists and engineer immigrant candidates—there has been a contrasting steady increase in the influx of foreign medical graduates (FMGs). According to *Foreign Medical Graduates of the United States, 1970*, a study of the American Medical Association,[243] FMGs have played an "important role" in meeting the chronically unfilled U.S. demand for doctors. As of December 31, 1970, there were 57,217 FMGs in the AMA's registry of physicians in the United States, representing 17.1 percent of the total physician population of 334,028. This figure does not include 6,174 graduates of Canadian medical schools. It does count 5,972 Americans who, failing to gain admission to the highly competitive medical schools of the United States, went abroad for training; however, this number is more than offset by an estimated 10,000 or more FMGs practicing in the United States but not included in the AMA registry.

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[241] *Ibid.*, pp. 49–56.
[242] *Ibid.*, p. 69.
[243] *Ibid.*, pp. 73–75.

The LDCs of Asia, Africa, and Latin America are heavily represented in the AMA statistics on FMGs for 1970. Africa is credited with 1,126 (2 percent), Latin America with 9,929 (17.4 percent), and Asia with 21,002 (36.7 percent). Altogether the LDCs account for an FMG population of 32,157 of the total of 57,217, or 56.1 percent, as compared with Europe's 24,756, or 43.3 percent.[244] High on the list are the following LDCs: Philippines, with 7,352 FMGs in the United States; India, with 3,957; South Korea, 2,095; Mexico, 1,831; Iran, 1,631; and Thailand, 1,098.

The growing prominence of FMGs in American medicine is further illustrated by the fact that, as of 1971–72, one of every six M.D.s practicing in the United States was an FMG (or one of every five, if FMGs from Canada are included); more foreign physicians were admitted to the United States in 1971 (10,540) than were graduated from American medical schools (8,974); there was one FMG to every two graduates of American medical schools serving on hospital staffs "in approved graduate educational positions";[245] about one-half of the candidates for State licensing examinations were FMGs (in some States, as many as three-quarters). Of almost 20,000 FMGs in graduate educational positions in American hospitals and universities in 1970–71, about 3,000 were interns, 13,000 were residents, and 3,000 were serving in other traditional training positions.

The existence of this situation has led to criticism of the United States. "Such criticism, much of which comes from within the country, illustrates both the magnitude and seriousness of the problem for domestic medical manpower concerns [246] and more important, for the purposes of this study, for its foreign policy implications." [247] For example, in an article on "The Migratory Flow of Doctors to and from the United States" in *Medical Care* for January–February 1971, Dr. Irene Butter of the University of Michigan School of Public Health wrote: "A permanent loss of doctors from the poorest to the richest nations is the most disturbing aspect of the medical brain drain." As reported by the Department of State in *Proceedings of Workshop on the International Migration of Talent and Skills*, October 1966, Dr. G. Halsey Hunt, Executive Director of the Educational Council for FMGs, stated: "It is a depressing and humbling experience for an American doctor to visit a medical school in one of the unindustrialized countries of Asia, to have his host open the conversation with a bland statement, 'You people in the United States and your hospitals couldn't get along without our doctors'—and to realize . . . this is a fact. . . . It ill becomes us to depend indefinitely on other countries for the production of medical manpower to provide services to American patients." [248]

THE FOREIGN MEDICAL GRADUATES AS A U.S. DOMESTIC PROBLEM

But setting aside questions of equity or the long-term foreign policy interests of the United States, the influx of FMGs poses a domestic problem. It does so by threatening U.S. medical standards and limiting the opportunities for aspiring Americans to study medicine. The quality of medical education in the LDCs from which most FMGs have come in recent years is considerably inferior to that of U.S. medical schools. FMGs as a group achieve much lower scores on medical practice qualifying examinations than do graduates of U.S. schools, and FMGs who pass the examinations tend to do so marginally. Not all FMGs succeed in getting licenses to practice in the United States, but many thousands do and others find employment (in mental hospitals, psychiatric wards in prisons, and institutions for the mentally retarded, for example) without full credentials. By their sheer numbers they have made it less necessary for American medical schools, in order to meet the growing demand for doctors in the United States, to expand their facilities to accommodate more American premedical students.[249] Thus many of the latter who meet the entrance requirements are turned away each year, while thousands of FMGs with inferior training enter the medical profession in the United States.

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[244] Oceania accounted for 404 (0.7 percent).

[245] Whelan, *Brain Drain*, p. 79.

[246] Concerns over domestic impact focus mainly on the question of medical standards and on the apparent effect of a substantial annual influx of FMGs in holding back expansion of U.S. medical schools. (Further discussion of these aspects follows.)

[247] Whelan, *Brain Drain*, p. 73.

[248] *Ibid.*, p. 74.

THE BRAIN DRAIN AS AN INTERNATIONAL ISSUE

The general problem of the brain drain became an international issue in the mid-1960s. In 1966, Assistant Secretary of State for Educational and Cultural Affairs Charles Frankel called it "one of the steady, trying, troublesome diplomatic issues" with which the U.S. Government was confronted, and added that many countries regularly raised the brain drain issue with the United States.[250] Another observer notes that:

> In the United Nations, delegates from the LDCs accused the West of transferring its exploitative urges from physical to human resources. On one occasion the representative from Dahomey called it an "odious bleeding" of Africa, a continuation of the slave trade. The General Assembly, where the presence of the LDCs is most forcefully felt, passed a resolution acknowledging the seriousness of the problem and expressing grave concern.
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> In 1966, the Iranian Minister in charge of Cultural Affairs at Iran's Embassy in Washington complained to American foreign student advisers about the drainoff of Iranian students (some 60 percent) studying in the United States. "Our government," he wrote, "is now thoroughly alarmed at the very high casualty rate of these skilled young people and is pressing us to take effective countermeasures."
>
> So concerned has the Indian Government become about the loss of its doctors that it has taken administrative action to discourage emigration. . . .[251]

The volume of complaints about brain drain received by the State Department from LDC governments has grown in recent years. In September 1973 an observer commented that a sign that the problem was becoming increasingly serious was "the pressure put on our State Department by about 80 countries which have asked that we send students skilled in essential fields back home when their programs are over,[252] and not encourage them to study sophisticated subjects such as psychiatry, for which there is not yet a need where they come from." In February 1974 Deputy Assistant Secretary for Education and Cultural Affairs Alan Reich acknowledged publicly that "at times this problem creates embarrassment for the U.S. Government." [253]

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[249] During the period 1962–1971, the number of FMGs entering the United States was almost as great as the number of students graduated from American medical schools: 75,630 as compared with 77,867. (For a detailed discussion of the FMG problem, see *ibid.*, pp. 173–201.)

[250] *Ibid.*, p. 259.

[251] *Ibid.*

[252] One of the complications attending the return of students to their native countries, as the study points out, is that the LDC's often do not have employment opportunities for educated specialists.

It was suggested at the outset of this commentary that the brain drain problem lacked sufficient visibility in developed countries to prompt official action by these major beneficiaries of the brain drain. However, it is evident from what has just been said that, insofar as the United States is concerned, there is a continuing official awareness of the problem at the State Department level.[254] Why, then, is remedial action not taken? Why, for example, is the United States literally dependent on foreign medical graduates as a substantial part of its perennial medical manpower supply?

THE COMPLEXITY OF THE BRAIN DRAIN PROBLEM

It is not enough to say in reply that, as in the case of most foreign policy problems, the brain drain problem is complex and there are no easy answers. It would seem reasonable to suppose that options must be open to the United States for at least ameliorating the problem and helping to direct the international migration of talent in more constructive ways.

Some options will be considered later in this commentary. For the moment, it must be conceded that the problem is indeed complex, especially for a country like the United States, committed to the principle of freedom. There is a close linkage between that principle and human mobility. "One of the salient features of migrations as a historical phenomenon is the frequency with which exceptional people . . . possessed of above average talents, strength, and courage . . . had 'the heart to brave new worlds.'[255] . . . Robert C. Cook, a longtime student of demography, gave this succinct explanation of the historical process of migrating intellectuals: 'Lots of bright people come from Ozark Junction—and the brighter they are the faster they come.' "[256] Is the United States to make agreements with developing countries which result in repatriation of a promising mathematician or nuclear physicist because the parent country needs sanitary engineers? Moreover, ". . . a specialist on cancer research from a small developing country who seeks intellectual contacts and research facilities available in a larger advanced nation in order to satisfy his professional ambitions may be making a greater contribution to his nation than if he remained home. 'The results of his works,' writes Frankel, 'flow outward and benefit his country as well as the country where he works.' "[257]

A further difficulty facing the United States with respect to the brain drain problem lies in the extent to which principle and advantage are interwoven. The only massive migration of talent away from the United States (occurring, ironically, when it was a developing country) was that of Loyalists at the time of the Revolution—estimates have placed their number as high as 100,000. Otherwise this Nation has been the beneficiary. As Assistant Secretary of State Frankel—

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[253] *Ibid.*, p. 260.

[254] Especially (the author comments) in AID.

[255] The phrase is that of Walter Adams, a student of the subject and editor of a book, *The Brain Drain* (New York, Macmillan, 1968, 273 pp.)

[256] *Ibid.*, p. 29.

[257] *Ibid.*, p. 14.

principal administration spokesman on the brain drain issue when it was receiving the most attention in the mid-1960s—stated in an official "Workshop on the International Migration of Talent and Skills" held in October 1966: "If there had been no brain drain in the past, we wouldn't be here, and this country wouldn't be what it is today."[258]

But there is a difference between enrichment of American scientific and technical resources in nuclear research as a result of emigration from a malevolently ascendant Germany under Hitler, or in the aerospace field due to postwar transfers of talent from a defeated Germany, and the expansion of resources in private medicine in the United States at the expense of the developing countries of Asia, Africa, and Latin America. To cite Frankel once again—this time in testimony before the Senate Judiciary Committee in 1968—

> . . . the "brain drain" is an important problem because it raises, in the most dramatic form, the question of the kind of world in which the United States wants to live a generation, or even a half generation from now. Over the long run we cannot stand the burden of a world in which most people and most countries will have inadequate intellectual resources and leadership of their own, and will have to lean on us and one or two other giants for their own well-being. This is why the brain drain is an important matter, and why it behooves us to seek affirmative measures to alleviate it.[259]

Role of Congress[260]

Through its constitutional powers to legislate immigration laws, Congress is the principal instrumentality for managing the inflow of manpower into the United States. Congressional interest in the brain drain issue over the past decade has reflected concern over international as well as domestic aspects. This concern was relatively intense in the period 1966–68, and resulted in hearings and studies by the House Government Operations Committee and the Senate Judiciary Committee. "Since then, Congressional interest has progressively diminished to the point where today it is largely limited to isolated concern for the internal aspects of the FMG inflow."

A bill introduced by Senator Mondale in October 1966 (S. 3905, the "International Brain Drain Act") was referred to the Senate Foreign Relations Committee; apparently no further action was taken. In 1967 the Senate Judiciary Subcommittee on Immigration and Naturalization held and published extensive hearings on *International Migration of Talent and Skills*. Concurrently, the House Government Operations Subcommittee on Research and Technical Programs undertook a study in some depth entitled, *The Brain Drain into the United States of Scientists, Engineers, and Physicians*. In 1968 the House subcommittee held extensive hearings on *The Brain Drain of Scientists, Engineers, and Physicians from the Developing Countries to the United States*. The House and Senate publications provided valuable insights into the problems and have been frequently cited in other writings on the brain drain.

However, nothing came of these congressional efforts. As of the date of the study (September 1974), overall congressional interest in the issue of the brain drain would have to be characterized as slight.

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[258] Whelan, *Brain Drain*, p. 27.

[259] *Ibid.*, pp. 252–253.

[260] Most of this section is a condensation of a section in the basic study entitled "Congressional Involvement in the Brain Drain Issue"—*ibid.*, pp. 234–236. The concluding part on foreign medical graduates (FMGs) is based on a discussion of "Congressional and Administrative Views on FMGs," pp. 196–200.

Possibly one reason for the decline in concern is that the United States has been acquiring rather than losing "brains." "But a more decisive reason is that the issue itself is set in the context of a paradox: the Nation is committed to the principle of liberalized immigration policies and to the principle of international education exchange; both would conflict with any administrative policies that could be designed to reverse the flow of emigrating professionals."

In the one brain drain sector which has attracted recent congressional attention—that of the Foreign Medical Graduates—there have been differences in view between concerned congressional spokesmen and the Administration. The latter:

> . . . sees the utilization of FMGs as an expedient for coping with the Nation's pressing medical demands. Thus, as Secretary Weinberger told the House Interstate and Foreign Commerce Subcommittee on Public Health and Environment in March 1973, "I don't think in and of itself [that] is necessarily a bad thing."
>
> However, Rep. William R. Roy (D-Kans.), a physician, faculty member of the Kansas University Medical Center, prominent leader in the Kansas Medical Society, and member of the Institute of Medicine of the National Academy of Sciences, disputed this evalution, saying, "May I suggest to you it is a bad thing," and for these reasons: "No. 1, we have young men and women—probably twice to three times as many—who cannot get in medical schools, who the medical schools admit are qualified; and that No. 2, we are stealing these physicians from other nations around the world who need them desperately." Dr. Roy asked: "Now will you explain to me why it is not a bad thing when we license over 12,000 foreign physicians?" [261]

Concern in the House of Representatives over the inadequacies of the Nation's health services and particularly over the growing prominence of FMGs was expressed in a bill which Congressman Roy introduced in April 1974: H.R. 14357, the National Health Services Manpower Act of 1974. The bill included proposals that would increase national manpower resources in the health services, reduce the number of postgraduate trainee positions available to FMGs and thus limit their inflow, improve the distribution of health services, and increase Federal Government support for health training programs. On the Senate side, in June 1974 Senator Jacob Javits sharply criticized the administration's position on the use of FMGs to alleviate the doctor shortage. Senator Javits pointed to the insufficient number of medical schools and inadequate Federal Government support for "desperately needed medical, dental, nursing, and other health profession schools." [262] Senator Edward M. Kennedy followed with a comprehensive critique of the administration's health manpower policies. The focus of this congressional concern, however, was on the domestic impact of the FMG problem rather than its foreign policy implications.

Status of the Issue

The author of the study presents some "tentative generalizations" on brain drain as a contemporary international problem:

> 1. A changing world environment occurring over the past three decades has created unique political and economic conditions for brain drain to flourish as a contemporary international phenomenon.
>
> 2. The political aspects of the brain drain problem are rooted in this changing world environment, specifically, in the processes of decolonization that has produced a "Third World" of independent states in Asia and America.

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[261] *Ibid.*, p. 196–197.
[262] *Ibid.*, p. 198.

3. The economic aspects of the problem derive from the nature of an evolving and globalizing industrial revolution with parallel developments in the world of science and technology. This dual phenomenon has created an expanding world economy, stimulated the universalization of knowledge, and generated a competition of needs and demands, priorities and goals between the advanced industrial societies and the LDCs: the former seek expanding markets and resources, human and material, for enlarging their industrial systems; the latter seek development and modernization of their undeveloped or developing countries. One of the primary objects of the competition is to secure trained professional manpower needed by both.

4. By reordering immigration priorities to stress quality over quantity and by enlarging incentives, the advanced industrial societies have been able to draw heavily on the LDCs for their professional manpower requirements, seemingly to the detriment of the latter.

5. In this competition for trained manpower [the] advanced industrial societies bear "universal culpability" for brain drain from the LDCs. The data suggest that the United States, long the mecca of world immigration, has been a prime beneficiary; though the number of immigrant scientists and engineers has declined in 1972, the inflow of foreign physicians and surgeons continues on a steady upward trend.[263]

There appears to be little awareness among the American people—or even in most quarters of the U.S. Government—of the significance of a brain drain to the United States from the LDCs. Yet, though largely hidden, the problem is a durable one that poses the question: What is the true attitude of the United States toward the developing countries and the development process? "For brain drain and development are principles in contradiction: one cannot have it both ways—an LDC cannot develop without an educated elite."[264] The contradiction is heightened by the inability of the United States—despite the pervasive current atmosphere of disenchantment with foreign commitments other than those with clearly perceived benefits to national security, and specifically despite a declining interest in foreign aid and international development—to escape involvement with the LDCs. These countries have the greatest concentration of the world's population and natural resources; they provide the industrially advanced states with both materials and markets; and, not least important in the restless world of 1976, they include most of the international trouble spots, actual or potential.[265]

The principal stages in solving or ameliorating a problem are (1) discovering that it exists; (2) perceiving what impacts it has or is likely to have, and assessing their significance; (3) analyzing its causes and deciding on remedial measures that would be feasible and worth the cost; and (4) carrying out those measures. In these terms, the brain drain problem as of the time when the study was published had yet to reach stage (1) for most Government officials and citizens in the United States; a relatively small number of officials and specialists had made some partial headway into stage (2), and a few even into stage (3); but virtually no headway at all had been made in stage (4).

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[263] *Ibid.*, pp. 87-88.

[264] *Ibid.*, p. 241.

[265] Cf. the following statement by Russell W. Peterson, chairman of the Council on Environmental Quality, in a *Washington Post* article (September 4, 1975) on "World Population: A Forgotten Crisis": "Today, about 70 percent of the world's population lives in the developing countries. At present rates of growth, that proportion will, within 35 years, grow to 82 percent. That rate of expansion, if unchecked, threatens unpredictable danger for all nations. When one considers the growing interdependence among the nations, the new politics of inequality in which developing countries charge that our abundance has been achieved at their expense, and the proliferation of sophisticated weaponry around the world, it becomes clear that no nation can escape the consequences of failure to moderate the world's population growth."

In summary:

A mood of withdrawal from extended—possibly overextended—foreign policy commitments seems to have enveloped the Nation in the post-Vietnam era. Reinforced by other powerful forces, termed isolationist by some observers, this mood has had the effect of restricting foreign policy initiatives and inducing a cautious attitude among lawmakers toward reaffirming traditional but far-reaching foreign policy commitments. Apathy and indifference toward economic development (and also immigration) is reflected in the attitude and posture of the administration; and thus far in the 1970s the Congress, preoccupied with other pressing matters such as the energy and constitutional crises, has seemed unaware that a problem exists.[266]

Prospects and Options

At the outset of this commentary the question was raised as to how a problem with important consequences for foreign policy and international relations—a problem, in this case, involving the interaction of science, technology, and foreign relations—could drop out of sight unresolved. The answer to this question is a composite one, and parts of it are suggested by common sense and common experience.

THE PROBLEM OF LOSING TRACK OF PROBLEMS

There are fashions in policy issues and political or diplomatic problems, as in virtually all human affairs—including village vandalism and international terrorism. Even the great issues are lost from view at times as attention is distracted to more urgent and exciting, if less important, themes or events.[267] When the issue or problem is of somewhat lesser magnitude than the population explosion, or the nuclear threat, or any of half a dozen other matters pertaining more or less directly to the ultimate question of human survival, it has that much less claim on center stage. Yet it may have an important, if undramatic, bearing on one of those more vital matters—including the ability of peoples to live together harmoniously in a world of growing pressures of interdependence. Taking action to solve or alleviate these underlying problems may be a useful and perhaps essential contribution to the establishment of interdependent relationships that in turn make the larger and more dangerous issues less intractable. This indirect approach may, at first sight, appear unsuited to that side of the American character reflected in the World War II slogan of the U.S. Army Air Corps: "The difficult we do immediately; the impossible takes a little longer." But the slogan is ironically at variance with the disciplined systems approach required to build and operate a fighter plane (not to mention a space ship). Moreover, for all the alleged impatience of Americans to get things done yesterday if not sooner, the American genius in organization and technology—which depends in both areas on the step-by-step systems approach—suggests that it is at least a disciplined and sustainable impatience, when problems are expressed in engineering terms.

Can a diplomatic problem be dealt with in such terms? In many cases the answer is: Yes—with at least some success, and perhaps considerable. Human affairs may be complicated by nonrational factors, some of them respected and cherished, which would not fit into a purely rational systems process, but many of the problems confronting diplomacy (increasingly many, as technology plays more and more of a part) are largely amenable to rational management.

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[266] Whelan, *Brain Drain*, p. 271

[267] In the article referred to in footnote 265, Russell W. Peterson writes that " . . . a year after the World Population Conference in Bucharest, population, the world's most pressing problem, is its forgotten crisis."

Although it concerns the sociology of science and technology, rather than science and technology as such, the brain drain problem appears to be one of these. The study presents persuasive evidence that it is indeed a problem, though largely unperceived, and one worth solving or at least mitigating. Its causes, which the study describes in some detail,[268] may be summarized as a combination of "push" and "pull" factors. The latter are what attract talented immigrants to one or another developed country, and especially the United States: economic gain, intellectual and cultural stimulus, demand for their services in challenging work, and so on. The former are all the circumstances which make a talented and educated emigrant from an underdeveloped country reluctant to return home: lack of adequate pay, work facilities, and professional challenge; cultural prejudice against innovation; political repression . . . and many more.

REMEDIES FOR THE BRAIN DRAIN PROBLEM

The study also contains a detailed discussion of remedies,[269] prefaced by the observation that:

> Virtually every commentary and analysis on brain drain presents a set of remedies, some exceedingly detailed and programmatic, as in the works by UNITAR, Gregory Henderson, Dr. Adams, Dr. Niland, the authors of the CIMT study, the various official materials published by the State Department and the Congress; and others generalized and suggestive. There is an understandable sameness about the remedies. The problem is universal; the ingredients are fairly uniform; and while remedies may vary from case to case, certain principles apply generally.[270]

These remedies fall broadly into the following categories:

(a) diminishing the "push" factors through economic development of the LDCs; creating scientific/technological infrastructures within the same countries; building professional manpower resources; establishing an educational base in science and technology; encouraging basic research as well as technological applications; improving communications among professionals, and building linkages among government, academic, and economic sectors; developing the scientific spirit; establishing regional "centers of excellence"—pooled science and technology resources; and

(b) at the same time, reducing the "pull" factors. The "pull" factors are less easy to define and generally less central to the problem, but a clear-cut exception exists in the medical brain drain: "A decade ago when the problem was far less acute than it is today, American students of brain drain and development specialists strongly urged the United States to expand its medical school facilities, and to train a sufficient number of doctors to meet present and future manpower demands (the shortage is generally placed at about 50,000 doctors). These two actions should go far toward ending American dependence on FMGs from the LDCs." [271]

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[268] See Whelan, *Brain Drain*, pp. 89-126.
[269] See *ibid.*, pp. 208-220.
[270] *Ibid.*, p. 208.
[271] *Ibid.*, p. 225.

Diminishing the "push" factors through the development process is obviously not a simple matter. The dimensions of the task are such as to require substantial assistance from the United States and other developed countries. In this context, the brain drain problem becomes secondary, though contributing and symptomatic; the primary object is development itself.

SOME U.S. OPTIONS IN COPING WITH BRAIN DRAIN

What assistance can be expected of the United States at a time when interest in foreign aid and development are at a low ebb? The study concludes with the thought that:

> In the face of many perplexing ambiguities and conflicting trends, perhaps the most that can be expected at the present juncture in U.S. foreign policy is that brain drain and the larger problem of international development be placed on the agenda of matters to be attended to when the Nation has recovered its balance, slowed its retreat from international involvement, and is prepared to resume a larger, and some would say a more creative, role in world affairs. This course, requiring a vision of the future and a reassessment of this Nation's place in it, would seem to be unavoidable, one dictated by self-interest, not a matter of moral conscience or mere national preference.[272]

There are some modest options which might be considered, however, while the Nation is making that reassessment. One which would involve assisting the United Nations to establish a country-by-country inventory of trained manpower resources, and a registry of qualified specialists willing to go where they are needed, is suggested in the essay on *Independence versus Interdependence* later in this concluding study. Another, for which the groundwork has been partly done, might involve a vigorous attack on the problem of U.S. medical education resources—primarily for domestic reasons, but also to reduce the medical brain drain. Again, the National Science Foundation (which has a continuing interest in the brain drain problem in particular and international science activities and relationships in general) might be asked to outline a broad program whereby U.S. governmental, academic, research laboratory, industrial, and other institutions and individuals might cooperate in (a) defining country-by-country needs of LDCs for scientific and technological infrastructure, (b) exploring the need for regional "centers of excellence";[273] (c) advising at both country and regional levels in the establishment of phased short- and long-range development programs; and (d) advising and assisting in the establishment of related statistical information systems, data banks, and information exchange procedures. In shaping and coordinating such a program, the Foundation—or perhaps alternatively the Department of Health, Education, and Welfare—might also call on appropriate U.N. agencies to undertake related initiatives with U.S. funding and collaborative assistance. In the medical field, as suggested elsewhere in this study, the World Health Organization would seem an attractive possibility.

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[272] *Ibid.*, p. 272.

[273] For a discussion of "centers of excellence"—regional bases in which several countries pool funds and resources to carry on scientific research and develop research skills suited to the needs of the area, but beyond the means of any one country—see *ibid.*, pp. 217-219.

Author's Reassessment as of January 1976

Following are some retrospective comments by Dr. Whelan:

The brain drain is as real a diplomatic problem for the United States today as it was in the mid-1960s, even if less visible. In the past year or so there has developed a renewed congressional perception of the reality of the problem. This perception is evidenced in the first instance in a growing awareness of interdependence and its importance for U.S. foreign policy. "It took the oil embargo to shake us up and make us aware of this interdependency." Another aspect is growing congressional concern over the domestic impact of the medical brain drain.[274]

> In this new era of interdependence [notes Whelan], international development holds a central place. International development means modernization; modernization means the application of science and technology. A new requirement is thus imposed upon the United States and the other advanced nations: To perceive the interrelationship in coping with the problems of international development. The brain drain problem enters the picture at this point, since skilled manpower is one of the many key requirements for development.

It has become especially evident in the past year or two that relationships between the developed countries and the LDCs are undergoing a real and substantial permanent change. "The old attitudes and assumptions of the West have lost their force; we can no longer exploit the LDCs as we have done since the beginning of the expansion of Europe in the 15th century." "Brain drain" is a form of exploitation, not perceived as such in the United States, but resented in most of the LDCs. The remedy may be found in "salvation by interdependence." Here the United States has the advantage of the values of its civilization. As never before, Whelan observes, this country can provide the saving grace for many of the world's problems: i.e., a saving grace resulting from judicious application of U.S. resources in science and technology.

U.S. interests in the LDCs, apart from purely humanitarian concern, derive from a need for global stability and for access to material resources that are important to us and vital to many of our Western allies. U.S. policy has been to seek peace and stability in the Third World as a way of heading off great-power confrontations. The LDCs constitute the most unstable area in the world. They have been a source of unending conflict, crisis, and tension involving the United States directly and sometimes indirectly. During the years 1945–67, 80 conflicts occurred in the Third World. Since 1967, major wars have erupted between India and Pakistan and in Nigeria, the Middle East, and Southeast Asia. The current conflict in Angola threatens U.S.-Soviet détente. The United States has been deeply involved in LDC troubles. One reason for instability in the LDCs is underdevelopment and poverty, aggravated by crises in energy and food, and the effects of world inflation. And, to repeat, one reason for underdevelopment is the brain drain.

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[274] In its consideration of the revision and extension of programs of Federal support for the education of health manpower, the 94th Congress has addressed the issue of the increasing reliance of the United States on graduates of foreign medical schools to provide health services in this country, and the concomitant loss of a vital health care resource to the native countries of these graduates. In July 1975 the House passed legislation (H.R. 5546) which contains provisions proposing to control the numbers of graduates of foreign medical schools who may enter this country. Other bills containing provisions relating to foreign medical graduates (S. 989, S. 991, S. 992, and S. 1357) are currently pending in the Senate.

Some Illustrative Questions

The central question which the problem of the brain drain poses for the United States is: What institutional arrangements will most effectively insure that significant foreign policy problems involving science and technology are not displaced from the agenda of official concerns but, rather, are actively addressed with the best resources available to the United States, through timely and proportionate efforts?

Should these arrangements (i.e., for identifying and tracking problems or potential problems, assessing both their possible impacts and the kinds of effort required to cope with them, and alerting the appropriate action agencies or recommending new ones) focus on the interface of science, technology, and American diplomacy, or alternatively on the full range of foreign policy issues? If the latter, would there be a tendency—following traditional patterns of policy issue identification and decisionmaking—to overlook or slight the technological component? If the former, would there be a danger of thinking too exclusively in technical and rational terms and losing sight of the larger picture with its blend of rational and nonrational elements?

What implications do the answers to these questions have for both long- and short-range foreign policy planning mechanisms and staffing in the executive branch: (a) at the Presidential level, (b) in the State Department; and (c) in the various mission agencies—all in relationship to each other? What for the Congress?

To accomplish U.S. foreign policy purposes in an increasingly interdependent (even though sometimes hostile) world, it seems essential that the good will which America has traditionally projected and evoked among the peoples of the world be refurbished and built upon. This good will—whether existing, or lost but recoverable, or potential—might be regarded as a third resource, along with technological and managerial skills, that America could summon in unique degree. Would it be useful to look to some U.S. institution, such as the Department of Health, Education, and Welfare or the National Science Foundation, to identify areas in which U.S. foreign policy initiatives building on these three resources might yield a high return in helping the poor nations of the world solve their development problems, for a relatively small expenditure of American money and effort? One such area, as mentioned in discussion of Issue Two (*The Politics of Global Health*) might be that of public health. Would country-by-country or regional assistance in solving problems of brain drain from the LDCs represent another such area? Would it be constructive for the United States to make diplomatic representations to regional organizations such as the Organization of African Unity, expressing willingness to help in the planning and establishment of regional and national science and technology infrastructures, with provision for balanced programs of higher education?

Should the United States assist in setting up regional "centers of excellence" of in strengthening those already in existence?

How can the United States best help to foster two-way communication between the developed countries and the LDCs to collect, analyze, and disseminate information about the migration of talent in relation to the development process? Is UNITAR the logical center for information collection and exchange on this subject? Should the United States establish a center for information and research on the subject, independently of (or in conjunction with) the United Nations?

To benefit both domestic and foreign policy what steps should Congress take to deal with the medical brain drain from the LDCs to the United States?

Are there steps which the Congress might take, for symbolic as well as practical reasons, to signal its concern over the problems of the developing countries and its interest in fostering the development process? For instance, might Congress endow an independently administered center for the long-range study of development problems, with provision for a substantial number of visiting fellowships for LDC students and administrators concerned with development?

In accordance with the principle that those institutions which will benefit should help bring about a stable world and the peaceful solution of problems generated by technology and change, should multinational corporations be required, induced, or encouraged to contribute to an international development fund? By what means? What concessions, if any, should be asked of LDCs in which the corporations operate in return for substantial contributions to such a fund? How and under what auspices should the fund be administered?

What, in general, are some of the ways in which the U.S. Government might form a constructive partnership with U.S. business and industry in furtherance of U.S. foreign policy goals relating to the development process? How can some of the great reservoirs of technological and managerial resources, skills, and inventiveness of U.S. private enterprise be tapped for work on development problems, including the brain drain?

ISSUE SIX: SCIENCE AND TECHNOLOGY IN THE DEPARTMENT OF STATE[275]

This is the most recent of the series of 12 studies of the interaction of Science, Technology, and American Diplomacy which began with publication in December 1970 of *The Evolution of International Technology*. The latter was designed to bring to the general subject some historical perspective and a current overview. In each of the intervening 10 studies a particular episode or continuing issue was examined both for its intrinsic and separate interest and to shed light on the general theme.

The present study is similarly intended to perform this dual function. It differs from the preceding studies, however, in that its subject is an operational expression of the theme of interaction among Science, Technology, and American Diplomacy. The preceding studies make abundantly clear that the interaction must be managed, insofar as it is within human ability to manage it. Failure to control and direct it involves risk of great damage to the public interest, both national and international, as well as loss of substantial positive benefit. In the U.S. Government, the locus for managing the interaction (apart from the President and his immediate staff) is the Department of State. Other agencies have operational responsibilities in the area of diplomacy, but the State Department is responsible for coordinating their actions in consonance with U.S. foreign policy.

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[275] U.S. Congress. House. Committee on International Relations. *Science and Technology in the Department of State*, a study in the series on Science, Technology, and American Diplomacy prepared for the Subcommittee on International Security and Scientific Affairs by Dr. Franklin P. Huddle, Senior Specialist in Science and Technology, Congressional Research Service, Library of Congress, U.S. Govt. Print. Off., Washington, D.C., June 1975, 180 pp. (Committee print.)

But how clearly is that responsibility defined, and how fully provided for in terms of competent staffs and appropriate authority? How broadly and effectively is it exercised? To what extent does the State Department in fact assume the focal role in this consequential area? To what extent is the State Department in fact the locus of decisionmaking and coordinated implementation of the widely varied activities involving Science, Technology, and American Diplomacy exemplified by the subjects of the preceding studies? Answers to these and related questions were sought in this focal study of the series.

Statement of the Issue

The study puts it simply, perhaps understating the case: ". . . a succession of Secretaries of State and their subordinates [have periodically asserted] the importance of science and technology for diplomacy. The roster of problems, issues, and instances that can be collected from such statements is impressive. But the effort to marshal the Department's resources to deal with this array of business does not seem commensurate with the demand."[276]

The State Department, then, has not failed to recognize, and has at least paid lip service to, its responsibilities for relating science and technology to diplomacy—

> . . . The attempt was made, but circumstances and competing demands on departmental resources stood in the way. Some specific projects and programs did peter out, others never got off the ground. Thus the need for a scientific and technological competence, spread throughout the Department of State, is great and increasing; what appears to be required is not some vast shake-up but a carefully managed, gradual, but steady growth in technical sophistication, a heightened visibility of technological content of diplomacy throughout. This appreciation should encompass both the positive and negative impacts of technology on diplomacy, and be perceived in both the regional and functional bureaus. There needs to be a deeper appreciation of the relationship between U.S. technological developments and the U.S. international posture, and of the potential contributions to U.S. diplomacy for foreseeable future technological developments.[277]

The heart of science and technology, the study further notes, is invention and change. The problem is to make this process serve—and in a subordinate sense, be served by—the conduct of U.S. diplomacy. To do both requires increased creativeness and receptivity to innovation. More specifically, "the rate of technological change and its impacts on the diplomatic environment call for a strengthened ability of the functional bureaus to perceive and interpret these changes and impacts, around the world, and for an increased alertness to the predictive power of technology analysis and forecasting." [278]

But this is more easily said than done. The problem is elusive. Prof. Edgar S. Robinson points out that it is rooted in a psychological attitude that is widespread in America, among the general public as well as among State Department officialdom:

> . . . while the public is quite aware of technology's omnipresence, it does not view technology as the progenitor of insoluble problems. Even as intractable a menace as thermonuclear weapons appears to have begotten the boon of détente and precluded the eruptions of a cataclysmic war. Liabilities cease to be distinguishable from assets.

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[276] Huddle, *Science and Technology in the Department of State*, p. 93.
[277] *Ibid.*, pp. 124–125.
[278] *Ibid.*, p. 125.

> Inasmuch as technological problems which resist ready resolution tend to lurk rather than loom and, as the example of the auto testifies, often make deferred rather than early debuts, the alarm is seldom sounded before the crisis [reaches a] climax. There is no evidence that the psychology residing [in the State Department] departs the norm. Secondly, where "State" is concerned, there seems to be a concerted psychology which treats science and technology more as incidental or adjunctive to diplomacy than as frequently a decisive factor. . . .
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> Not even the oil situation has overpowered the regnant myth that technological traumas of international magnitude are basically *political*. . . . [Diplomats] seem not as yet to have begun to apprehend the extent to which the techno-tail wags the diplo-dog.

Robinson concludes that any restructuring of the State Department to accommodate science and technology will be superficial without a fundamental change in this entrenched attitude: science and technology have been, as he expresses it, "ushered into discreet quarantine in a nursery soothingly tagged 'The Bureau of Oceans and International Environmental and Scientific Affairs.' "[279]

Importance of the Issue

It is a matter of stark reality that success in managing the interaction among science, technology, and diplomacy may spell the difference between peace and war. "The conduct of diplomacy involves a balancing of competition and cooperation, of competing national aspirations and shared international concerns. To the extent that the balance tilts toward international cooperation the prospect is one of peace; a tilt in the other direction leads to the prospect of tension and conflict."[280] Although, as the study notes, this statement is an oversimplification of a complex process—competition in many areas of human activity, like trade, athletics, and even scientific or other scholarly achievement, implies a larger context of cooperation and agreed rules of the game among competitors—it remains essentially valid.

It is common knowledge today, a generation after the first unleashing of nuclear power, that effective international control of nuclear technology in its peaceful as well as its military applications may be central to human survival. But the impacts of science and technology are not limited to the growing business of avoiding holocaust; they extend pervasively and often constructively into many areas of everyday experience. The study lists a few of the functions or fields in which they have begun to affect people in all parts of the world and have brought about many changes in relationships among States:

—Instant communication and visual reports at great distances;
—Unlimited recording and rapid manipulation of data;
—Photographic surveys of the total area of the Earth;

. . . .

—Global weather prediction;
—Cheap synthetic substitutes for many cash crops;
—Chemicals and drugs with global social and environmental impacts; and
—Massive and rapid air transportation.[281]

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[279] Edgar S. Robinson, Professor of Government, American University, to Franklin P. Huddle, July 25, 1975: "Notes on *Science and Technology in the Department of State*."

[280] Huddle, *Science and Technology in the Department of State*, p. 2.

[281] *Ibid.*, p. 1.

Anyone who is reasonably well informed in public affairs and familiar with the machinery and processes of government, including specifically the State Department, will recognize the enormous difficulty of relating these and other contemporary technological developments to national interests, both domestic and diplomatic. Nevertheless, failure to relate national policy to such developments—and where possible to anticipate where they are tending and to direct them into constructive channels—would represent a surrender to technology as an uncontrolled force. One result of such surrender could well be the erosion and ultimate disappearance of social and political democracy in those countries where they now prevail; another would probably be a further deterioriation in the quality of life for all peoples everywhere, beyond what may be due to already foreseeable factors, most of them related to growing population pressures.

In short, there would appear to be no more important issue of foreign policy for governments to cope with than the behavior of international technology. If this is the case, there is no more important issue confronting the State Department.

How the Issue Developed; U.S. Involvement

Preceding studies in this series have dealt with the evolution of international technology in general, and the circumstances of a variety of special instances of it, as they affected the United States. This section will not attempt to tell the story of how U.S. diplomacy has responded historically to the growing influences of science and technology, but will give some attention to related developments involving the State Department since 1950.[282]

OFFICIAL U.S. CONCERN WITH SCIENCE AND TECHNOLOGY

Under the influence of men like Franklin and Jefferson, science and technology were closely interrelated with American diplomacy in the early years of the Republic. After the Presidency of John Quincy Adams, however, "interaction of diplomats—and Government officials generally—with science and technology appears to have diminished. In the main, the modern concern of the Department of State with science and technology dates from the close of World War II. It was from here in 1946 that the Acheson-Lilienthal Report was drafted, proposing a diplomatic initiative to bring the newly developed technology of atomic energy under international control."[283]

Other positive factors besides atomic energy compelled the attention of international diplomacy, and in the United States that of the State Department, to the importance of science and technology. Among these factors were the creation of such U.N.-affiliated international institutions as the World Health Organization, the Food and Agricultural Organization, and the United Nations Educational, Scientific, and Cultural Organization (UNESCO); the impulse to restore the global network of scientific societies, disrupted by war; early recognition of the need to mobilize technology to repair war damage, restore the economies of devastated countries of Europe, and assist in the development of poor countries everywhere; and the expectation, nourished by awareness of the many important contributions

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[282] Readers seeking a more detailed historical perspective are referred to pages 11-71 of *Science and Technology in the Department of State* (op. cit.)

[283] *Ibid.*, p. 11

—Progress of technology having special international significance, e.g., satellite communications, weather forecasting, resource surveys, and military surveillance; strategic weapons; weather modification; deep seabed mineral mining; and the like; and

—Transnational and oceanic environmental threats posed by refineries, irrigation projects, large tankers, supersonic aircraft, deep sea mining, offshore oil drilling, and the spread of toxic agricultural and other effluents.

The traditional pattern of diplomacy does not appear to provide the kind of alert perception and early readiness needed to deal with such matters as these. Contacts are necessary not only with the diplomats of other nations but also with technological leadership in the United States. The diplomatic impacts of technology must be assessed in advance, and remedial action devised to meet future needs. An important fact about technological—i.e., industrial—change is that it takes time. Industry may indeed be adaptable to shortages of materials or environmental regulation, but not without time delays. Diplomatic resolution of problems arising out of technological change must be sensitive to this constraint.

It is not evident that the Department of State, and in particular the science bureau, is structured to collect, analyze, and use technological information inputs for diplomatic policy guidance. For example:

—The Advisory Committee on Science and Foreign Affairs was permitted to lapse.[442]

—Although the "scientific attachés" were restyled several years ago as "scientific and technological attachés," and attempt to keep abreast of technological matters, they are not adequately staffed to do very much in this direction.

—Technological resources of the Department in the functional bureaus are modest to nonexistent.

—While the Department's science bureau has recognized the importance of "technology," the word itself was removed from its formal title and the heavy load of operational chores makes difficult any substantial attention to this complex subject.

—The Secretary of State has been generous in his commitment of the United States to international programs to advance technology, but the ability to implement these commitments is in doubt.

—No significant effort appears to have been made to search out or coalesce the views and advice of the U.S. technological community on present or future impacts of technology on U.S. diplomacy.

—Significant technology-based diplomatic initiatives of the United States have been few and far between, despite U.S. technological preeminence.

The main point of this recital appears to be the need for a closer coupling of diplomats and technologists, and between private industry and the formulation of foreign policy.

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[442] *Ibid.*, p. 41.

Some Concluding Observations

To a considerable extent the role of private industry has changed from one of reliance on the Department of State for assistance in overseas transactions to one productive of major if unguided impacts on the substance of diplomacy. This change implies the need for the Department to adjust its relationship towards private industry in the United States. There is no substantial evidence that it has done so.

Large international problems growing out of technological change already confront the Department; others are in prospect. These problems give plenty of advance warning of their impact. But the Department seems not to have taken advantage of these forewarnings. The emergence of problems may be slow but technological adjustments to change are also slow. Time is thus a resource to be used effectively if it is not to be wasted. Prompt and early recognition of problems and the planning of vigorous correctives are required.

Some Questions for Further Consideration

In the further development of the theme of this essay, the following questions are offered to indicate the scope and possible directions of the inquiry:

What should be the relationship between the Department of State and U.S. industry engaged in overseas operations?

In what ways can private companies support and advance U.S. diplomatic goals?

What areas of technology offer particularly promising opportunities for private contribution to U.S. diplomatic goals?

How can the motivation of private industry be increased in the conduct of operations and initiatives beneficial to U.S. diplomacy?

How can the views of other countries best be obtained and transmitted to U.S.-based companies on their constructive participation in coherent programs abroad?

How can the dilemma be resolved of the wide gap between formal ethical standards and evidences of individual breaches of ethics in the relations between U.S. businesses and officials of foreign governments?

Is there a distinction between U.S. diplomatic goals and the U.S. national interest?

Has the Department of State made available to U.S. businesses any general guidelines on the conduct of foreign activities?

Does the Department maintain an awareness of the consequences for the U.S. economy of overseas commercial and technological developments?

Conversely, does the Department maintain an awareness of technological developments in U.S. private industry having a potential for beneficial or injurious consequences for overseas diplomatic relations?

By what means and through what channels can the Department of State communicate to U.S. industry on social, technological, and economic trends affecting diplomacy, and with reference to U.S. diplomatic goals?

When major new international scientific programs are proposed and activated, should the Department of State examine their possible implications for new industrial technology of diplomatic significance?

At what point? With what kinds of expertise? Should the private scientific and technological communities be consulted on these matters in the course of such an examination?

What multinational regions in the developing parts of the world might be candidates for the sort of regional development plan evidenced by the Tennessee Valley Authority? Are the opportunities for constructive participation of the private sector in such regional schemes adequately appreciated? Might this same regional concept be applied to the seabed?

What arrangements can ensure that contracts and negotiations between U.S. businesses and offices of state-trading (communist) nations are made known to the U.S. Departments of State and Commerce for policy planning and coordination purposes? What policy guidance is available to U.S. companies and how can it be bettered?

Are there special diplomatic considerations regarding relationships between the Soviet Union and U.S.-based multinational corporations? How are these to be evaluated?

Should thought be given "to the formulation of a more explicit technological strategy designed to increase the social return of its immense investment in science and technology and to minimize its negative environmental effects?" What are the policy resources the United States can bring to bear on issues of national strategy in technology, and how are these to communicate with the industrial sector where such a strategy must be implemented?

In the field of global health, can the tremendous medical and industrial technology resources of the United States be mobilized in support of U.S. diplomatic objectives? What initiatives might best serve this purpose and how might they be organized and guided?

What technologies might further the general objective of improving global health and where does the responsibility lie for sponsoring their development and use?

Could cooperative arrangements be developed for oil-rich countries to work with the U.S. chemical industry to provide fertilizers and pesticides to developing countries? Might such cooperation be furthered by assisting the oil-rich countries to develop petrochemical industries to produce these high-energy agricultural materials?

Should there be recognition that transfers of value can include more than finished goods, materials, capital, and credit? (For example: transfers of technology and human expertise.) Might a system of equity be devised in which exchanges of tangible values and exchanges of knowledge and knowledgeable people are taken together, so that all parties benefit from the combined exchange?

Even if it is not possible to maintain a strict accounting of the value of transferred technology and "brains," should not these be recognized as important elements in the flow of value from nation to nation?

What organizational and institutional changes are needed in the Department of State to improve the coupling of technology and diplomacy?

How can the Department tap the private industrial community for technological expertise to make diplomatic policymaking more responsive to technological forces for change?

What actions by private industry, at home or abroad, might contribute toward U.S. diplomatic goals and how can the Department motivate and coordinate such a private effort?

IX. INDEPENDENCE VERSUS INTERDEPENDENCE

A disturbing feature of the world of the mid-1970s is the widespread and seemingly growing opposition between the forces of independence and those of interdependence. Both forces appear to have great potential for helping to solve the world's major problems. But if badly managed in relation to each other or out of control, they may have an even greater potential for destruction.

Interdependence has many meanings. As the term is used in this study, it signifies a dynamic condition in which the forces of growth and change oblige the nations and peoples of the world to rely increasingly upon each other for their security and welfare—though relying no less (but rather more) upon themselves. Self-reliance, mutual (bilateral) reliance, and common (multilateral) reliance are all embraced in this usage of *interdependence*. Also implicit in this usage is the need to achieve a workable balance between independence and interdependence. Further implicit is the need for diplomacy to mediate the growing intercourse among nations—the greater the degree of interdependence in economic, environmental, security, and other areas of human affairs, the greater the need for competent diplomatic personnel, institutions, procedures, and, above all, understanding of the forces which are shaping today's and tomorrow's world. (The last requirement applies beyond the Foreign Service, the State Department, and the White House to the entire Government, including both domestically and internationally oriented departments.)[443]

The purpose of this essay is to draw insights from the 12 Science, Technology, and American Diplomacy studies that bear on the independence-interdependence dichotomy. In particular, the role of technology in fueling and in reconciling the opposition of the two forces needs to be noted. In a more immediate sense, diplomacy is the agent of reconciliation: can there be hope that enlightened diplomacy will bring about an Hegelian "higher synthesis" in which the constructive values of independence and interdependence are merged and their destructive potentials blunted? This question is one with which the governments of the world's nations must come to terms.

Independence as an Historic Force

The concept of independence is associated with such ideas as liberty, self-determination, and self-reliance. A manifestation of independence which has special relevance to this study is nationalism.

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[443] It should be further noted that the terms *independence* and *interdependence* are used in this essay mainly with reference to sovereign nation-states and their interrelationships. It will not escape the reader, however, that many parallels exist with regard to the independence-interdependence spectrum in the interrelationships of states or provinces, cities; a great variety of organizations other than governmental, and just individual people.

"Nationalism," wrote Herbert Hoover and Hugh Gibson in 1942, "has developed from the deepest of primitive instincts and emotional forces in mankind." They continued:

> It gathers from a thousand springs of common race with its common language, religion, folklore, traditions, literature, art, music, beliefs, habits, modes of expression, hates, fears, ideals, and tribal loyalties. . . .
>
> From all these racial instincts and mores rises the eternal yearning for independence from foreign subjection or domination. . . . Nations are eternally striving for independence. . . .
>
> Who can even recite the repeated wars for independence of the Greeks, the Germans, the Spanish, the French, the Romans, and their successors, the Italians? . . .
>
> . . . .
>
> Nationalism can readily expand into dangerous forms . . . [but] will continue as long as man inhabits the earth and will have to be embraced in any plan to preserve the peace.[444]

The words seem prophetic. Writing early in World War II when the hope was widespread that victory would bring an end to nationalist excesses everywhere, the authors were referring to a world of only 60 separate nations. Now there are about 150. The behavior of many nations today tends—despite the emergence of new internationalist forms and vocabulary—to reinforce the skeptical view of human nature and its selfish motivations which Hoover and Gibson shared with the Founding Fathers and which is reflected in the system of checks and balances built into the Government of the United States.

Independence has been a constructive force in the development and growth of the United States and many other countries. It has not generally been achieved and maintained by following Marquess of Queensberry rules. The tactics of nations which are challenging the Western industrial democracies on both political and economic fronts today, however distasteful to those challenged, may sometimes effectively advance the independence-related interests of the challengers. On the other hand, some of the tactics—blindly, or at least not farsightedly, pursued—may be contrary to those interests in the long term, and perhaps even in the short term. They may collide with national interests which would be better served by a posture of interdependence, or by a more carefully adjusted balance between independence and interdependence.

No nation in history has been better nourished in its independence than the United States—nourished by a vast natural endowment of land and other resources, by the insulation of great oceans and weak neighbors, and by the imaginative development and application of new technologies. Understanding the potential of this endowment and sharing with Washington a keen distrust of foreign entanglements, Hamilton and Jefferson sought autarky: i.e., economic, as well as political, independence from the rest of the world. The Jeffersonian concept was one of self-sufficiency with an agricultural base; the Hamiltonian, self-sufficiency on a foundation of industry. But not, for Hamilton, total self-sufficiency: industry, more than agriculture, implied trade, and Hamilton favored trade. And trade implied the development of varying degrees of economic interdependence. With the growth of the Republic and its industry, trade relations also grew, and the United States moved by gradual stages from a unique position of substantial independence to one of substantial dependence on other nations.[445]

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[444] Herbert Hoover and Hugh Gibson, "The Problems of Lasting Peace," in *Prefaces to Peace: A Symposium*, cooperatively published by Simon and Schuster, Doubleday, Reynal and Hitchcock, and Columbia University Press. New York, 1943. pp. 160-161.

Technology and Interdependence

Technology, more fundamentally than trade, created interdependence. The Age of Technology which began with the Industrial Revolution has now, in a new and explosive phase which began with World War II, become the Age of Interdependence as well. It was an achievement of high technology, the atom bomb, which ushered in the Age of Interdependence and has since served as one of its more ominous reminders. Writing in 1948 to Herbert Hoover, then heading the Hoover Commission study of reorganization of the executive branch, Henry L. Stimson (who had served as President Hoover's Secretary of State) observed that "The progress of science and invention brought with it a vastly increased interdependence among the nations of the world." [446]

In 1964 a book by Vincent P. Rock entitled *A Strategy of Interdependence* outlined an approach for applying technology to the control of conflict between the United States and the U.S.S.R. instead of to the escalation of armaments. Rock quoted from an address in June 1963 by President John F. Kennedy at Frankfurt, Germany: "We live in an age of interdependence." [447]

Interdependence as a Growing Concern of Political and Other Leaders

In 1975—the year in which, ironically, celebration of the Bicentennial of American Independence began—public references to the theme of interdependence assumed epidemic proportions, prompting one well-informed observer, Richard N. Gardner, to call it "surely the political catchword of our time." Writing in a special magazine issue marking the 30th anniversary of the United Nations, Gardner went on to say: "The crises of energy and food, of inflation and depression, all testify to the increasing interdependence of our world." [448] In the same special issue, Secretary of State Henry A. Kissinger registered regret "that outmoded expressions of rivalry should be increasingly asserted at the very time when a more elevated and unified sense of global obligation is required," [449] and Harlan Cleveland asserted that "Our problem . . . is . . . to cope with interdependence." [450] Particularly noteworthy not only for its perceptive analysis but also for the fact that (while not an official view) it resulted from a State Department initiative was Prof. Lincoln R. Bloomfield's article, "Toward a Strategy of Interdependence," published by the State Department Bureau of Public Affairs as a 30-page Special Report (No. 17, July 1975).[451]

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[445] One measure of this dependence is the special effort which the administrations of Presidents Nixon and Ford felt it necessary to give to establishing and publicizing "Project Independence," an expensive and protracted campaign to reduce U.S. reliance on foreign energy sources.

[446] Huddle, *Science and Technology in the Department of State*, p. 18.

[447] Vincent P. Rock. *A Strategy of Interdependence: A Program for the Control of Conflict Between the United States and the Soviet Union*. New York, Charles Scribner's Sons, 1964, 300 p. (President Kennedy's statement is quoted more fully on p. 364: "We live in an age of interdependence as well as independence—an age of internationalism as well as nationalism. . . . Today there are no exclusively German problems, American problems, or even European problems. There are world problems.")

[448] *UN 30:* A Special Issue of *The Inter Dependent* (Journal of the United Nations Association of the United States of America, New York), vol. 2, no. 7, August 1975. p. 16. (Currently Professor of Law and International Organization at Columbia University, Gardner served from 1961 to 1965 as Deputy Assistant Secretary of State for International Organization Affairs.)

[449] *Ibid.*, p. 20.

[450] *Ibid.*, p. 9. A one-year "National Commission on Coping with Interdependence" was created in December 1974 under the auspices of the Aspen Institute for Humanistic Studies. Originating in a suggestion by Assistant Secretary of State for Educational and Cultural Affairs John Richardson, the Commission seeks answers to four questions: (1) What adjustments in American lifestyles and workways seem indicated in view of growing U.S. interdependence with other nations? (2) How ready are the American people for the projected kinds of changes? (3) To what extent are U.S. institutions capable of perceiving and analyzing these changes and of reacting to them accordingly? and (4) What new attitudes and arrangements may be required to enhance the capacity of Americans to cope with interdependence? A major conclusion reached by the Commission, as set forth in "Coping With Interdependence: A Commission Report," was that the main obstacles seemed "to arise from the pervasive assumption that the line between 'domestic' and 'international' is still a useful and relevant tool in making institutional policy." (Undated report. Aspen Institute for Humanistic Studies, Princeton, N.J.)

A wider selection of recent statements on the theme of interdependence might include such examples as the following:

—President Gerald R. Ford's nationally televised "State of the World" address of April 10, 1975, in which he characterized technology as presenting "a vast new agenda of issues in an interdependent world."

—Numerous references in the press. On September 3, 1975, for instance, the *Washington Post* observed editorially that "It is comforting to think of a world in which all nations recognize that both necessity and civility commit them to policies of interdependence. But domestic political considerations and national economic and political interests regularly cut across the imperatives of interdependence." [452] (In another editorial, 4 days later, the *Post* referred to "the new interdependence that the IMF [the International Monetary Fund, meeting in Washington the previous week] convened here to discuss.") [453] On July 3, 1975, the *Grinnell* [Iowa] *Herald-Register* printed a report by its managing editor on a conference on international problems he had attended in June, in which a Canadian participant had said that "the U.S. needs to refresh its views of other countries' views . . . interdependence does not necessarily lead to cooperation." [454]

—The statement by Dr. Edmundo de Alba, Scientific Counselor, Mexican Embassy, at the August 1974 conference at Henniker, New Hampshire, on National Materials Policy Requirements: "No country in the complex technological world of the present day is completely self-sufficient in the raw materials consumed by its people. Even the so-called 'supplier' countries in their turn need materials from other countries. This interlinking of availabilities and necessities is the most profound reason to mount an effort to resolve the problem of world materials supply by interdependence within international justice." [455]

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[451] The article summarized portions of a 4-volume study, *Analyzing Global Interdependence*. The study was the product of a year-long inquiry that the State Department, through its external research program, had commissioned the Massachusetts Institute of Technology to conduct. It was prepared by Professors Hayward R. Alker, Jr., Lincoln P. Bloomfield, and Nazli Choucri. In "Toward a Strategy of Interdependence" Bloomfield distinguishes among the main kinds of interdependence (environmental, security, and economic) and examines interdependence separately as "fact," as "good," as "bad," as determined partly by how it is perceived, and as balanced or unbalanced. Unbalanced or asymmetrical interdependence, he emphasizes, is dysfunctional—the more so as it is perceived to be unbalanced. Bloomfield goes on to discuss the requirements and implications of a U.S. "interdependence strategy." The first element in an effective interdependence strategy for the United States, he contends, is "a program of modest 'decoupling' of those interdependent links which threaten to create excessive strain through excessive 'presence' "—economic, both governmental and commercial, as well as military. A second element is increasing as rapidly as possible the number and complexity of links between the United States and the principal oil-producing exporters. A third involves applying to alliance relationships "the insights gained from analyzing the psychological aspects of dependencies." Finally, many security, economic, and environmental functions traditionally managed on a national basis can no longer be confined by national boundaries; collective management is inescapable. Bloomfield adds that all contemporary governments are inadequately organized to deal effectively with contemporary problems, and that, in the case of the United States, "there should be a strongly enhanced capacity to perform 'cross-sector' analysis of interdependence issues; this entails . . . [adding] an improved capability to the Department of State, and the Executive Branch generally, for anticipating crises and insuring that the foreign policy system is better organized for the long pull."

[452] *Washington Post* editorial, "A World Economic Order," Sept. 3, 1975.

[453] *Washington Post* editorial, "A Recession Abroad," Sept. 7, 1975.

[454] Pinder, A. J. Report on Wilton Park IV Conference, sponsored by the American Friends of Wilton Park and held at the Wingspread conference center, Racine, Wisconsin.

[455] U.S. Congress, Office of Technology Assessment, *Requirements for Fulfilling a National Materials Policy: Proceedings of a Conference Organized by the Federations of Materials Societies for the Office of Technology Assessment*, August 11-16, 1974. Edited by Franklin P. Huddle, Congressional Research Service, Library of Congress; Foreword by Emilio Q. Daddario, Director, Office of Technology Assessment. Published by arrangement of the American Society for Metals, 1975, 194 pp. (p. 84.)

—The statement at the same conference by Jean-Pierre Hugon, Ministere de l'Industrie et de la Recherche, Republic of France: ". . . the most important fact is that we are now entering a new era of worldwide interdependence. There is not any estimation to be done: we are condemned to interdependence. Inferences must be drawn from that new state of things, all over the world." [456]

—The observation by former diplomat and *Japan Times* editor Kazushige Hirasawa in an article on "Japan's Emerging Foreign Policy" in *Foreign Affairs:* "Because of their economic vulnerabilities, and development experience, the Japanese have become one of the world's most active proponents of global economic interdependence." [457]

—Congressional hearings and reports, as well as numerous statements in the *Congressional Record.* The theme appears, for example, in the title of the printed record of hearings before the House Foreign Affairs Subcommittee on Foreign Economic Policy in May 1974: "Global Scarcities in an Interdependent World." [458]

—The observation of the Murphy Commission Report (which also states the case, in principle, for a constructive balance between independence and interdependence): ". . . an interdependent world will intensify relations between states and peoples and place a premium on international cooperation, [but] it does not diminish the need to retain that independence necessary to provide leadership, to secure cooperation in satisfactory terms and to make the contribution to world needs which national skills, resources and experience permit." (The Report further states: "We believe that the interdependence of foreign and domestic policy will grow.")[459]

Man's perspective on the world has undergone a drastic change since the Age of Interdependence began, more or less simultaneoulsy with the founding of the United Nations:

> Thirty years ago, the UN's Founding Fathers did not (could not?) foresee the interlocked conflicts of values and scarcities we now call the "interdependence issues." On food, we worried about surpluses. Population planning was almost unmentionable and certainly untouchable by governments. Energy was cheap, air was largely unpolluted, water was free and plentiful, the seas were a zone of liberty, and raw materials were there for the benefit of those with the wealth and the power to extract them. Trade and investment were "free," which meant they were often expensive for the poor. And the monetary system was managed by those with the hardest money.
>
> Today, the international system built on those assumptions is in disarray because the assumptions are on the cutting room floor. . . . [460]

Obstacles and Problems Affecting Constructive Interdependence

A word on some of the obstacles to the various forces that appear to be thrusting interdependence upon the peoples of the world, and on the complex dimension of growth versus ecological stress, may assist in rounding out the context for the examination of the six cases and six issues which follows.

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[456] *Ibid.*, pp. 84–85.

[457] Kazushige Hirasawa. "Japan's Emerging Foreign Policy." *Foreign Affairs*, Vol. 54, No. 1, October 1975. p. 170.

[458] U.S. Congress. House Committee on Foreign Affairs, Subcommittee on Foreign Economic Policy. *Global Scarcities in an Interdependent World.* Hearings, 93d Cong., 2d sess., May 1, 8, 9, 15, and 22, 1974. Washington, D.C., U.S. Govt. Print. Off., 1974. 259 p.

[459] Report of the Commission on the Organization of the Government for the Conduct of Foreign Policy (the Murphy Commission), Washington, D.C., U.S. Govt. Print. Off., June 1975, p. 26.

[460] Harlan Cleveland, "The Pace of Mutation," *UN 30* (op. cit.), p. 11.

THE OBSTACLE OF POLITICAL AND ECONOMIC NATIONALISM [461]

Virulent political nationalism is perhaps the most obtrusive of the obstacles. It is paradoxical that many of the nations which have recently achieved political independence, but are economically and technologically dependent on the rest of the world, are aggressively asserting their sovereignty. Along with the emergence of ministates with their collective tendency to create imbalances in the United Nations and in other international forums or relationships, the trend toward nationalism is in seeming conflict with the broader and longer-range imperatives of interdependence.

Sometimes accompanying this political nationalism, or an ingredient of it, is a tendency toward a limited form of economic nationalism.

One kind of economic nationalism follows Western economic and industrial models but seeks to bend them to further advantage through such devices as expropriation and nationalization of extractive industries or formation of cartels to control the supply and price of energy and mineral resources. Another rejects Western ideas of progress and reflects distrust of Western industrial society and its patterns of technology, development, and growth in general.[462] A point of view associated with the latter position was expressed recently by Mahbub ul Haq, Director of Policy Planning and Program Review for the World Bank; he maintained—

> . . . that the Third World must return to considering the needs of its land and peoples first. . . . He said that the real question was not whether the Third World had a future, but whether the industrialised Western world had a future. In the next 25 years, he sees the economic, financial and cultural balance of power shifting to the Third World.[463]

Economic nationalism of either kind may sometimes serve the immediate interests of the country which adopts it. It runs counter, however, to the purposes associated with proposals for worldwide economic cooperation advanced by Secretary of State Henry Kissinger in his message to the United Nations General Assembly of September 1, 1975.

U.S. PROPOSALS FOR GLOBAL ECONOMIC COOPERATION

In the U.N. address that Ambassador Daniel P. Moynihan delivered for him,[464] Mr. Kissinger said: "It is not enough to insure the minimal economic security of the developing countries. Development is a process of growth, of acceleration, of greater productivity, higher living standards, and social change. This is a process requiring the infusion of capital, technology, and managerial skills on a massive scale."

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[461] Professor Edgar S. Robinson of American University, who reviewed this essay in draft, comments in a note to the associate project director (November 17, 1975): " 'Quickie nationalism,' as manifested in the LDCs in the wake of imperialism's withdrawals, is rather doubtfully to be lumped together with the lengthy, gradual evolution of nationalism in the West. The distinctive, diversified assertions of independence characterizing many LDCs, frequently in spite of internal heterogeneity, have properties peculiar to them and not necessarily associated with such classic Western attributes as the consolidation of a middle class [and] a matrix of urbanization. . . . Thus, 'nationalism' seems to be a catch-all caption somewhat wanly endowed to convey the elements, flavor, and nuances of behavior in lands remote from its origins. . . . I don't know what can be done to alleviate this conceptual problem . . . other than to stipulate its existence as an 'alert' to the reader. We seem to be stuck with an emotionally taut, empirically slack, word."

[462] It would probably be more accurate to say "seeks to reject." The course of outright rejection is, as a practical matter, hardly open to any nation today. Nations can, however, resist economic penetration and slow it down somewhat. This is a point closely related to the factor of cultural and psychological resistance to interdependence, discussed below.

[463] Thecla R. Fabian. "Does the Third World Have a Future?" (Report on a work session of the Second General Assembly of the World Future Society, held in Washington, D.C., June 2-5, 1975). *TA Update* (Newsletter of the International Society for Technology Assessment), vol. II, no. 2, summer 1975.

[464] Henry A. Kissinger. "Global Consensus and Economic Development." Department of State, Bureau of Public Affairs, Office of Media Services. September 1, 1975.

To this end the Secretary of State proposed the creation of an International Industrialization Institute and an International Center for the Exchange of Technological Information; the planning of a conference on science and technology for development; agreement on standards of conduct for both governments and transnational enterprises (multinational corporations) with respect to the operations of the latter; adjustments in the relationship of the developing countries to the world trading system; establishment of a consumer-producer forum for every key commodity; and a "major new international effort to expand raw material resources in developing countries. The United States proposes," he added, "that 1976 be dedicated as a year of review and reform of the entire U.N. development system."

Along with these concrete proposals Secretary Kissinger made a plea for international consensus and cooperation. He described the world of 1975 as one of "some 150 nations . . . in an environment of continuing conflicts, proliferating weapons, new ideological divisions, and economic rivalry." Then he went on to say:

> We profoundly believe that neither the poor nor the rich nations can achieve their purposes in isolation. Neither can extort them from the other—the developing countries least of all. . . . The reality is that the world economy is a single global system of trade and monetary relations on which hinges the development of all our economies.

But it would seem that a more immediate reality in the area of global economic cooperation and development is the pressing need for constructive and sustained leadership in the United Nations. The concrete proposals by Secretary Kissinger move in that direction; it remains to be seen how seriously the U.S. Government will follow through. A first step might be to strengthen the U.S. Government's own institutional arrangements and mobilize its own resources for supporting his proposals.

CULTURAL OBSTACLES TO INTERDEPENDENCE

Cultural and psychological factors may greatly reinforce political nationalism. American isolationism in the 19th century was supported by an outlook shaped largely by the open frontier and the seeming limitlessness of natural resources: "The nation became a great farmer-mechanic democracy, its people possessing . . . qualities of independence, ambition, and individualism quite novel in the history of the world."[465] Independence was an important motivating force in the life and growth of the young nation. Its role in interdependence among the nations of the world, on the other hand, was almost negligible before World War I, and did not become a matter of commitment until after World War II. Another major example of insistent independence and self-reliance is that of the Chinese Communists during the past three decades.

Successful North Vietnamese resistance to a series of external threats over a long period was founded on more than political and ideological nationalism or skill in tactics of guerrilla warfare. Although the wellsprings of that resistance are still not understood in this country,[466] it is obvious that a fierce spirit of independence was at work.

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[465] Wayne Caldwell Neely, *The Agricultural Fair*. (Columbia University Studies in the History of American Agriculture; edited by Harry J. Carman and Rexford C. Tugwell.) New York, Columbia University Press, 1935, p. 72.

Instances of resistance to Western foods, however nutritious and needed—such resistance constituting an obstacle to both normal trade practices and extraordinary measures like famine relief—have occurred in Oriental, Arab, and other non-Western societies. This kind of cultural barrier to rational interdependence arrangements usually derives both from taste preferences formed out of deeply rooted traditional practices and from historic religious beliefs.

Longstanding French resistance to "Americanization" (of language, TV programs, products, lifestyle in general) might serve as a relatively sophisticated example of cultural resistance in the developed world. Recently this posture has been mirrored by French and other Canadians.[467]

It is not the intention here to denigrate cultural resistance to change.[468] Cultural diversity is important to human civilization. However, since cultural and psychological factors tend to support independence and to work against interdependence, they need to be taken into consideration in any attempt to balance the two forces.

GROWTH VERSUS ENVIRONMENTAL CONSTRAINTS

There are significant relationships between the two dichotomies of growth versus environment and independence versus interdependence.

A posture of independence may tend at certain stages in national development to favor growth. This is likely to be true for nations relatively self-sufficient in resources, including requisite skilled and unskilled manpower; the classic case is that of the United States of the 19th century. It may also be true for nations with unbalanced resources but a great wealth of one highly essential commodity—the obvious example is oil—which can command a premium price in the world market if vigorously exploited. In both cases, the process of active growth and more sophisticated development tends to lead in time to a situation of interdependence as rising domestic standards of living and the need for export markets amplify exchanges with other nations. "Have-not" countries, however, are limited to a choice between interdependence and continued poverty.

Perhaps the process of growth leads to an ultimate condition of global interdependence by three stages: (1) the exchange of materials and services which nourish growth; (2) the redistribution of the negative ecological impacts of growth; and (3) not yet at hand but foreseeable, a global approach to the complex problem of controlling and ultimately limiting growth.

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[466] Margaret Mead testified before the Senate Foreign Relations Committee on June 20, 1969, that "we know nothing whatsoever about the North Vietnamese, because no research has ever been done on the subject . . ., nor do we know anything about the South Vietnamese." On the other hand, she said, "we knew how the Japanese responded to bombing and how the Germans responded to bombing. Those were first-class pieces of social science research done at the end of World War II which we totally disregarded when we decided to go in and bomb Hanoi." (U.S. Congress, Senate. *Psychological Aspects of Foreign Policy*, hearings before the Committee on Foreign Relations, June 5, 19, and 20, 1969. Washington, U.S. Govt. Print. Off., 1969, pages 96 and 118.)

[467] In the article referred to above—"Toward a Strategy of Interdependence"—Lincoln P. Bloomfield writes: "It is not simply the one-sidedness of U.S. investments in Canada that has produced mounting strain. Rather, it is the totality of penetration in the social, cultural, and informational sectors. . . ."

[468] Cultural resistance of this kind may also derive some support from technology-alienated elements in developed countries who see uncontrolled, too rapid, or misdirected growth as destructive of human values. Professor Robinson notes: "As John Dewey observed, the multiplication of points of contact may likewise multiply points of friction. Thus, technology's incalculable impact upon the concourse of states may produce the very opposites of cooperation and community."

The phenomenon of growth poses a major dilemma for the 21st century. The economic, political, social, cultural, and psychological health of Western society, and increasingly that of all of the world's societies, are tied to growth. The structure and dynamics of human civilization are intimately bound up with the phenomenon of growth in many complex ways—as an ethic, in habits of production and consumption, in the spending of time and the flexing of both physical and intellectual muscles, and in the way society is organized. It is difficult to conceive of an end to growth (the achievement of a stable state), much less to predict how it will come about. Yet logic compels recognition that space-consuming human activities cannot infinitely expand within finite space.

The world's foremost laboratory for the study of growth as a complex problem is Japan:

> A survey of Japan's experiences with environmental disruption, population growth, and diminishing resources casts into sharp relief the problems common to all industrialized and industrializing nations. Moreover, the negative consequences of Japan's rapid growth policies may well foreshadow an advanced stage of our planetary predicament. . . .
>
> The Japanese environment is so riddled with industrial effluent and agricultural chemicals that in 1973, the entire population panicked before the threat of a nationwide epidemic of "pollution diseases," incurable human disorders resulting from exposure to intense environmental pollution.
>
> But is it fair to extrapolate from Japan's experiences to throw light on future conditions in other parts of the world? Unfortunately, the answer is yes. For Japan's environmental problems reflect assumptions underlying modern industrial society everywhere. . . .
>
> Indeed, the economic effectiveness of Japanese patterns of industrial organization have gained increasing recognition. Many developing nations openly aspire to fashion their own futures after the Japanese blueprint, choosing to cope with pollution control only after a high economic growth rate is achieved. . . .[169]

ATTEMPTS TO CURE POLLUTION BY REDISTRIBUTION

The authors just quoted cite numerous specific examples and causes of pollution in Japan and conclude that Japan's political and economic leaders have come to recognize the need for changes in the industrial system. One proposal under serious study would create a "New New Japan"—"the epitome of an ultramodern post-industrial society"—by replacing high-resource and high-energy-consuming activities located in the Japanese islands with knowledge-intensive, minimal-pollution industries (for example, computers and information processing, communications, and aircraft). Existing industrial installations would be redistributed and emphasis would be placed on developing better parks, playgrounds, sewage and waste-treatment systems, and medical and social services.

To maintain economic growth and a rising standard of living,

> . . . economic planners propose transferring dirtier industrial production to developing nations eager to emulate Japan's domestic miracle. Thus, the imperative need for restructuring Japan's domestic economy is seen to dovetail with the rising economic aspirations of developing nations. The key concept underlying this transformation is the "international division of labor." Over-industrialized,

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[169] Norie Huddle and Michael Reich with Nahum Stiskin. *Island of Dreams: Environmental Crisis in Japan.* (Foreword by Dr. Paul R. Ehrlich, afterword by Ralph Nader.) New York and Tokyo, Autumn Press, 1975. pp. 22–24.

inflation-plagued and resource-poor Japan would transfer its production facilities—or simply sell its technology—to foreign nations which enjoy rich deposits of natural resources, offer plentiful, cheap labor, and . . . "have more elbow room from an environmental viewpoint." . . .[470]

The concept is an ingenious one, but—the authors conclude—it has the fundamental weakness that environmental pollution cannot indefinitely be exported nor neatly contained. What is at issue is "man's assault on the life-support systems of the earth as a whole." [471]

Clearly, as the Japanese themselves perceive, the problem of pollution in Japan in the near term is shaping up as a problem in interdependence.[472] The ultimate problem which it appears to foreshadow—that of limiting growth or of defining appropriate kinds of growth—will be an infinitely more delicate and complex problem in interdependence, when its time comes.

THE OBSTACLE OF IMPERFECT COMMUNICATION

Three factors which complicate the process of working out a constructive balance between the impulses of national independence and the imperatives of global interdependence have been noted: nationalism, cultural resistance, and antagonism between the aggressive demands of growth and the defensive requirements of ecology. Another is communication, in the sense of shared thoughts, values, and thinking processes. People of different cultures cannot work together effectively if they do not understand each other's ways of thinking. Thus, Americans tend to think inductively, arguing from the particular to the general; Russians, it has been observed, tend to think and speak deductively, concluding "what must be" from established principles. For example, a Russian factory doctor told a group of American scientists visiting her textile mill: The Soviet Union cares about worker safety and welfare; air polluted by dust and fibers from the materials used in this factory is dangerous to workers' health; therefore we have equipment to purify the air; "and so, gentlemen, look around you—there is no air pollution!" According to one of the American scientists, the visitors saw the air filled with clouds of cotton lint.[473] One wonders whether a better appreciation of the differences in thought processes on the part of both the Russians and the Americans involved in the Baruch Plan negotiations might have influenced their outcome.

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[470] N. Huddle et al., *Island of Dreams* (op. cit.), p. 322.

[471] *Ibid.*, p. 325.

[472] From the Japanese standpoint the problem is one of exporting pollution; from that of many of the less developed countries (LDCs) it is one of importing growth. At the United Nations Conference on the Environment (Stockholm, June 1972) the LDCs objected to U.S. efforts to impose American environmental quality standards on them. For the past several years, diplomatic and other representatives of LDCs attending meetings of the Washington, D.C., chapter of the Society for International Development have made it clear, whenever the subject came up, that sentiment at home favored tackling the problem of achieving growth first and worrying about pollution later.

As a short-term solution to the LDC problem of growth in conjunction with the developed country problem of pollution, the exchange may prove a popular expedient in the years immediately ahead. This likely trend was suggested in an informal talk to the staff of the Office of Technology Assessment on October 15, 1975, by Dr. Dieter Altenpohl, director of research for Alusuisse Aluminum Co. Dr. Altenpohl expressed doubt that future aluminum reduction plants would be built anywhere but in LDCs which had the electric power and could tolerate the fluoride effluent.

[473] Credit for the epistemological observation about the difference between American and Russian thought processes belongs to Professor Edgar S. Robinson. The anecdote concerns an actual experience of an American social psychologist during a Soviet visit. (The point is not that American thinking is superior; in most problem-solving situations—in those which involve human affairs, at any rate—an approach which combines induction and deduction is better than one which leans too heavily on either.)

The Issue of Independence Versus Interdependence as a Theme in This Study

An examination of the ways in which the dimension of independence/interdependence figures in the six cases and six issues presented in the Science, Technology, and American Diplomacy study series—or any of the other five dimensions considered in this part of the final chapter—was not specifically anticipated when the series was originally planned in 1969, but was decided upon after the 12 studies had been completed. The common perspective which the authors of the latter shared with the project directors was essentially limited at the outset to the broad theme of interaction among science, technology, and the formulation and conduct of U.S. foreign policy. The findings which follow are a reflection, therefore, of the separate inquiries of different authors.

These findings support the widely held thesis that interdependence of the world's nations and peoples is a growing reality, with a primary link to technology. As the applications of technology spread, so does the condition of interdependence.

Some of the cases and issues are explicit on this theme; others are illustrative by implication.

CASE ONE: THE BARUCH PLAN

The symbolic significance of the atom bomb and its consequences for interdependence have been noted. The mere existence of this weapon in large numbers and with sophisticated delivery systems deters opposing nuclear powers from major belligerency. This technological development has thus deprived war of its social function. The function of war in the past has been to help intransigent adversary states resolve otherwise intractable issues. Or, to put it another way, war and the capability to wage it was a means of assigning a cost to intransigence. Issues may still be intractable, and adversaries may still be intransigent, but total war has lost its social function—nuclear war, at any rate—because its virtually unthinkable cost is grossly disproportionate to the value of the service it would perform. In this sense, war—nuclear war—has priced itself out of the market.

But there is a flaw in that generalization: it applies only to the *rational* use (or rather, withholding from use) of nuclear weapons by responsible powers who understand the consequences of massive nuclear exchanges. Today all other nations are at the mercy of the United States and the Soviet Union—but one must reach for rather unlikely scenarios to conceive of rational use of nuclear weapons by either country. Tomorrow all nations, *including* the United States and the Soviet Union, may in fact be at the mercy of some reckless possessor of atomic bombs—perhaps an unidentified aggressor at whom it is impossible to strike back in time to affect the outcome.

It may be yielding to fantasy to suppose that if the Baruch Plan negotiations had led to a control agreement involving the gradual elimination of nuclear weapons, the possibility of a new balance of terror would have been forever precluded, and nations would at last have got down to the serious business of eliminating war itself as a means of resolving major international differences in the face of intransigence. There seems little doubt, however, that success in the negotiations would have helped smooth the world's passage into the era of interdependence.

Worth special note is the fact that the United States, at that time the sole possessor of the atomic "secret," and historically committed to the assertion of sovereign independence, should have taken the lead in proposing to yield up both the secret and its sovereignty to international control of this ultimate weapon. It is both ironic and tragic that the Soviet Union, principal exponent of Marxist internationalism and abnegation of "capitalist wars," should have rebuffed the overture in a spirit of intransigent nationalism and sovereignty. The failure to reach agreement lay, perhaps, on both sides: in the inability of the United States to foresee or communicate the consequences of a new agreement and in the unwillingness of the Soviet Union to forego the early prospects of its own nuclear arsenal and East European hegemony for the larger but more remote chance of global amity.

Yet, despite the inability of the two leading nations to reconcile or moderate their differences in the face of the ultimate weapon, the subsequent spread of the weapon itself creates a global impasse that is forcing all nations toward interdependence and away from the independence that obstructed the first moves to control the weapon. As the next case shows, bits of sovereignty are being yielded up in the face of the general need to keep the weapon itself and all its associated technology from bringing about an inadvertent holocaust.

CASE TWO: COMMERCIAL NUCLEAR POWER IN EUROPE

The atom bomb signaled the world's entry into the Age of Interdependence in a context of common defense and security; the context of the peaceful uses of nuclear energy is one of development and growth—though still with a nagging concern over the security problem posed by reactor byproducts. President Eisenhower's Atoms for Peace initiative embraced both aspects:

> The initial objectives of Atoms for Peace were to help contribute to a more stable and peaceful world by sharing with other nations the benefits of nuclear science and technology, to improve U.S. relations with other nations through such sharing, and to minimize pressures for independent and potentially hazardous nuclear programs by cooperating in peaceful uses under conditions which would discourage diversion of atomic materials and equipment to military purposes.
>
> In recent hearings before the House Subcommittee on International Cooperation in Science and Space of the House Committee on Science and Astronautics, the U.S. Atomic Energy Commission observed that these objectives continue to be valid. With the passage of years, additional objectives have taken on increased importance. For example, the Atoms for Peace program has enabled the United States to take part in the rapidly expanding world market for nuclear goods and services. The program is also "providing an invaluable mechanism for a worldwide approach to health, safety, and environmental problems which transcend national boundaries." [474]

The President's proposal also established a precedent for intergovernmental action and a partial relinquishing of sovereignty in a major peacetime scientific and technological endeavor:

> Atoms for Peace has been unique as a form of international cooperation. While cooperation across national boundaries has occurred in many scientific fields, international cooperation in the peaceful uses of nuclear energy came about as the result of deliberate decisions and specific actions of governments, rather than of scientific communities, to share the benefits of an important new science and technology.[475]

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[474] Donnelly, *Commercial Nuclear Power in Europe*, p. 26.
[475] Donnelly, *Commercial Nuclear Power in Europe*, p. 27.

The discovery of nuclear fission as a source of energy occurred on the threshold of a period in history when the energy needs of heavy industry and of the population at large in the developed world were to begin to exceed the commercially available supply. The future need for nuclear energy as an increasing proportion of the total energy supply was foreseen at the time of the Atoms for Peace message. There was then, however, no special sense of urgency in this regard, and the United States took the practical course of looking to the European nations—whose more urgent energy requirements made necessary for them what was not yet necessary, or politically and commercially feasible, in America—to work out the problems of establishing a nuclear energy industry.

Dr. Donnelly describes the situation as it was before the Atoms for Peace proposal:

> . . . prototype nuclear powerplants had to be designed, built, and put into operation to provide engineering and operating experience for the nuclear industries and the electric utilities. The AEC wished to get on with this demonstration, but its nuclear power program became caught up in the controversy of public versus private generation of electricity. One pragmatic solution was to build demonstration plants overseas. Arranging such demonstrations became the task of the diplomats. The AEC supported the idea of building demonstration plants abroad. In 1952, AEC Commissioner T. Keith Glennan forecast an increasing demand abroad for nuclear power: "This demand naturally will arise first where present costs of electrical energy are high and this suggests that such a program may have an important place in a future Point Four program." Europe was a likely location because it needed electricity and costs of European electricity were higher than in the United States, thus setting an easier economic goal for the designers and engineers. AEC Commissioner Henry D. Smyth endorsed the idea that the nuclear power stations might be built abroad with U.S. financial help through Point Four funds. He too pointed out that since power production in the United States was much cheaper than in other countries, the economic incentive for nuclear power would be greater abroad.
>
> By the early 1950s nuclear power had begun to attract the interest of the makers and executors of foreign policy. Still it remained of limited import as the governments and diplomatic services of the United States and its allies struggled to assure the survival of a free Western Europe. The experience then with a massive outpouring of U.S. financial and technical aid through multinational organizations was to point the way for later multinational ventures in nuclear power.[476]

A climate of expectation and near-readiness, then, had been established; Atoms for Peace provided the stimulus to action. There followed the building of new multilateral institutions, the forming of special bilateral and multilateral relationships, and the developing of extensive patterns of research, information exchange, and negotiations on international agreements.

"Interdependence" is an abstraction; patterns, relationships, and institutions give it concrete meaning.[477] Nuclear energy has brought nations and people together in many ways, in both fear and hope, during the three decades since it was unleashed, but its constructive potential has barely begun to be realized. If the world's peoples are spared the military and environmental hazards of fission for another two or three generations, the foreseen technology of nonmilitary fusion may follow. Though it is to be recognized that nuclear power has been, and continues to be, employed by some countries to promote or safeguard their national independence, it seems likely that by that time no development in human history will have done more to bring about global interdependence and the abandonment of outmoded assertions of sovereign independence than the scientific discovery and technological application of nuclear energy. But it is not too soon to chart the implications of further additions to nuclear technology on the structure and course of interdependence.

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[476] *Ibid.*, pp. 13-14.

[477] Professor Robinson adds: "The plain truth is that, today, the peoples of the world and their official spokesmen have no option but to worship at nationalism's altar. There exist absolutely no alternative symbols (and these are crucial) toward which they can gravitate and upon which they can firmly fix their loyalty. . . . The problem is that of creating images, flowing from the realities of interdependence and transcending the nation-state system, with which the earth's peoples can identify. . . . The medieval church accomplished a somewhat analogous feat, thereby causing the deferral of nationalism itself. . . . The framers of the American Constitution undertook a superb attempt to reconcile unity with diversity in a country then very far from being homogeneous and one which was not wholly unlike a world-into-itself. . . . I would add that, if we prove too fearful or unimaginative to face up to the question of reconciling . . . ideals on a global scale, the undirected course of events may cause us to end up, historically, 'either with mincemeat or monolith'."

Finally: "The psychological problem inheres in the difficulties of making interdependence an inspiring ideal, so that it will cease to be seen as a menacing *competitor* to patriotic pride and self-determination. Interdependence has come into its own as a fact, but not as a philosophy."

CASE THREE: THE POLITICAL LEGACY OF THE INTERNATIONAL GEOPHYSICAL YEAR

As a study in cooperative interdependence, the International Geophysical Year was an almost ideal model translated into action. Most of its scientific achievements and constructive political legacy resulted from the coordinated efforts of scientists from 67 countries, stationed in every part of the globe. Their acts of cooperation required no special orders or persuasion, beyond the dissemination of an idea and some organizing to carry it out; in the main they posed no insoluble problems of intercultural communication or accommodation. As author Harold Bullis observes:

> . . . Scientists tend inherently to recognize the interdependence of their efforts and accept that interdependence as one of the basic conditions of the environment in which they work. It is then relatively easy for them to accept the extension of this principle to the environment in which they live.[478]

The author carries this thought a step further to suggest that possibly a pattern of interdependence in the scientific sphere may carry over into the diplomatic. He sees a political legacy left by the IGY in the form of international agreements, treaties, and working relationships. His assessment of the IGY, given as part of the earlier commentary on Case Three, ends with that thought, attributed to the scientists themselves:

> Several factors help provide at least some degree of optimism that the scientists may be justified. One is the great importance of first perceiving and assessing, and then communicating, technological impacts. Scientists and technologists are likely to comprehend the possible consequences of new discoveries and applications in the fields of energy or of ecology, for example, more immediately or fully than are politicians. Partly because of the IGY, both technological developments and political (or institutional) developments which significantly affect the human condition can be more readily appreciated and utilized today. First, they can be brought to the attention of both political leaders and the public within countries (it is becoming increasingly difficult for leaders to withhold them even in dictatorships); secondly, they can be shared among the countries of the world far more readily than was possible just two or three decades ago. Wider public understanding of technological impacts and a stronger institutional framework (governmental, professional, and the press) for increasing that understanding still further are in large part responsible in the first instance; technological advances in rapid communications and transportation are among the factors responsible in the second.[479]

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[478] Bullis, *The Political Legacy of the International Geophysical Year*, p. 53.
[479] *Ibid.*, p. 54.

A striking example of what Bullis is referring to is given in an article by Peter Osnos, in the *Washington Post* for September 26, 1975, entitled "Ecology and Pride Save a Soviet Lake." The article relates how, "In the name of progress, Soviet authorities decided a few decades ago to empty one of the world's largest and most beautiful mountain lakes," Lake Sevan in Soviet Armenia. "They reasoned that the water could be better used to irrigate the valleys nearby and provide electricity for much of Armenia. But that challenge to nature proved to be a mistake," seriously disrupting the ecological balance of the area, "and now, at enormous cost, Lake Sevan is being saved. . . . Reversing any ambitious [electrification] project . . . in the Soviet Union is hard enough, but doing so on primarily environmental grounds is a substantial tribute to popular will."

It takes scientists to diagnose a condition of pollution, technologists to correct it, and political decisionmakers to give the order. Increasingly, as the communications process grows technologically more sophisticated and knowledge is more widely disseminated, the public may also be involved.

Yet there is irony in the fact that the IGY, as a foremost demonstration of scientific interdependence and cooperation, was also the occasion for a resurgence of technological competition for nationalistic objectives. The Soviet scientific achievement of an orbiting satellite, employing military missile technology for the purpose, galvanized a U.S. response in both military missile development and the "space race." While, on both sides, the development of nuclear-armed ballistic missiles brought about an unusable but terrible threat to civilization, the huge outlays for technology to penetrate outer space contributed to the emerging view of the shared planet as "Spaceship Earth." Both directions of technology, in different ways, added to the compulsion upon the two superpowers to accept the technological consequences that continue to force them and the rest of the world toward some form of rational accommodation—in other words, to yield up bits of sovereignty toward interdependence.

CASE FOUR: THE MEKONG PROJECT

Regionalism—characterized in the Mekong study [480] as the application of technology on a geographic rather than politically defined basis—is inherently an expression of interdependence. It acknowledges the need of an area which transcends the boundaries of local (city and county), subnational (state or province), or national jurisdictions in pooling its human, material, and financial resources to share economic, security, environmental, and other benefits. On a small scale, the numerous regional councils of government and "Metro" systems which have been established in the United States in recent years bear witness to both the dependence of geographically related local jurisdictions upon each other for the successful management of problems of common concern (for example, ground and air traffic control, provision of adequate public transportation, solid and liquid waste management, air and water pollution reduction, and crime control) and the difficulty of attacking such problems through traditional intergovernmental channels.

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[480] Huddle, *The Mekong Project*, 70 pp.

An American experiment on a grander scale, the Tennessee Valley Authority, illustrates the regional approach applied to a multistate area. Furthermore:

> Regionalism became almost an ideology in the United States during the depression years. Its advocates cited the Tennessee Valley Authority as the idealization of the concept. Although admittedly a capital-intensive development of dams, power plants, transmission lines, flood control works, and navigation improvements, TVA was much more: a complex program of soil improvement, agricultural processing, farm technology, reforestation, and commercial development of the entire basin of the Tennessee River and its tributaries.
>
> The TVA concept was characterized by the following features:
>
> Corporate organization
> Exercise of the sovereign powers of the Federal Government
> Right to hold and sell property, to sue and be sued
> Authority to construct and operate power dams and distribution lines—to sell power wholesale or retail
> Domain over the entire watershed of the Tennessee River
> A policy of contracting with State and local governments and individuals for cooperative development arrangements
> Maintenance of its own civil service and labor relations
> Incorporation within its central organization of miniature departments of commerce, agriculture, labor, health, mining, and engineering technology, in addition to its more widely publicized power activities.[481]

Thus, a feature of the Government-sponsored TVA experiment was the employment of centralized regional—rather than national or subdivided—planning and authority. What made this arrangement possible in the face of traditional American antipathy toward Federal Government management and control in the normally private development sector was the economic emergency and the need for concerted, large-scale action in a severely depressed region. Although it was both technically and politically successful, and although many of the lessons learned in the experiment were applied elsewhere in the United States, the TVA model as such was not repeated.

Applied subnationally, the regional approach requires either the exercise of strong central authority, or institutional relationships and procedures for achieving consensus and cooperation, or some combination of both. The TVA experiment leaned in the first direction (though it actively sought cooperation with local authorities); cooperative joint organizations of States to develop such regions as Appalachia, Four Corners, and the Great Lakes, coordinated by the Department of Commerce, illustrate the middle ground; the regional councils of government depend on consensus, owing their success mainly to good staff work performed at shared expense and directed at problems of commonly perceived urgency.

Manifestly, procedures for assuring support and effective management of regional enterprises at the subnational level are subject to varying combinations of control and consensus (other than in countries where even local development is centrally planned and directed). However, the requirement for voluntary agreement to accomplish regional undertakings in the international sphere—where there is no central authority—is inherent:

> . . . the differences between subnational and international regions are vast. The primary distinction is that of sovereignty, of competing national interests. The nations comprising a region need to reconcile their own interests with their participation in a joint enterprise. In addition, the Great Powers have the problem of reconciling their own national interests with their bilateral relations with the individual states of the region and with the region as a whole.[482]

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[481] *Ibid.*, p. 9.
[482] *Ibid.*, p. 12.

The regional approach comports with the Jeffersonian principle of fixing governmental responsibility for a given function at the lowest (or most localized) level at which it can be performed effectively. Properly carried out it also meets the Hamiltonian requirement for sufficient centralized direction to accomplish coherently the purposes in view. It is easier for the members of a regional association to identify and act upon their readily identifiable common interests than it is for United Nations members as a whole to perceive and respond to their less evident or specific shared goals. Regionalism is a middle way:

> Beyond bilateral deals and specialized multilateral dealings, there is the regional level of cooperation. Neighbors should first settle their own disputes; that is the conventional wisdom. It has a long and distinguished lineage.
>
> . . . .
>
> Several years ago Sir Oliver Franks . . . described regionalism as "a halfway house at a time when single nations are no longer viable and the world is not ready to become one." [483]

The Mekong Project offers testimony to the durability of the regional approach in the face of great obstacles. That it was kept going in the face of war, insurrection, and nonrecognition of the participants implies not only that the need for it was recognized by those responsible within the region but also that they were able to work together in support of the project despite political differences. The evidence presented in the basic study indicates that in doing so they relied heavily on reaching agreement by consensus rather than by more formal means, such as parliamentary procedure.[484] To the extent that they did so they were perhaps showing the developed world, with its Western habits of parliamentary decisionmaking by majority rule, what is for most of the world a more natural way to make progress in regional arrangements, and what may prove to be a more effective way to proceed in the global forum of the U.N. General Assembly:

> To convert the U.N. system to consensus decision-making will seem visionary only to Americans and Europeans who have grown up in the belief that parliamentary procedure and Robert's "Rules" are the very stuff of democracy. But that is a minority view in the modern world, and even in the West is a rather recent notion, not deeply rooted in classical or Christian thought. "Consensus" will not seem extraordinary to any one who has participated in a Quaker meeting, grown up in a modern family, or sat on a British or American jury. It will not seem strange to a Japanese businessman, a Chinese scholar, an African villager. Chaidir Anwar Sani, the Indonesian delegate to the U.N., . . . [has] charted a way out: "Indonesia," he said, "has a tradition of decision making through *musyawarah* and *mufakat*, consultations and consensus. Most of our countries have at one stage or another known that method. The process may be lengthy, cumbersome, sometimes exasperating, but we are much better off than immediately after our independence when we experimented with the "half-plus-one-is-right" method.
>
> . . . My delegation would not like to see the United Nations turn into an arena for confrontation between majority and minority, or a factory to turn out resolutions, but a forum for the combined and concerted efforts of all the countries in the world to find concrete solutions." [485]

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[483] Harlan Cleveland, *The Obligations of Power: American Diplomacy in the Search for Peace*, New York, Harper and Row, 1966, pp. 56 and 62.

[484] Huddle, *op. cit.* See especially pp. 20–30.

[485] Harlan Cleveland, "The U.S. vs. the U.N.?" *New York Times Magazine*, May 4, 1975;

Regionalism as a concept is more than a halfway house between independence and interdependence. It offers a means by which the separate nations of the world can group themselves into larger multinational units, with each participating nation yielding up some portion of its sovereignty in exchange for the shared benefits enjoyed by the region as a whole. The earlier study of commercial nuclear power in Europe demonstrated that nations may be willing to relinquish a measure of sovereignty in exchange for the greater safety of nuclear control. The mutual efforts of the Riparian States of the Lower Mekong basin exemplify another form of interdependence in which some elements of sovereign independence in economic planning and technological self-determination are traded for the greater gains possible through concerted regional development. If it should come about that 20 or 30 regions of the world, rather than some 150 independent and sovereign nations, are represented in the U.N. General Assembly, it will be because the member states of each region find the forces that hold the region together stronger than these that separate the nationalities comprising it.

Each action that tends to strengthen the ties that hold each multination region together would be a step toward a more coherent and manageable world of global regions, each interdependent within itself and each region interdependent in its relations with other regions of the world. Such a concept, perhaps not altogether beyond human attainment, seems to be suggested by Cleveland and Franks, and reinforced to a degree by the "Spirit of the Mekong."

CASE FIVE: EXPLOITING THE RESOURCES OF THE SEABED [486]

The issue of independence versus interdependence is moving toward a climactic contest in the impending question of sovereignty of the seabed. The oceans of the world, from the earliest formulation of international law, have presented the challenge to seafaring nations: how to allocate law and responsibility in a global region open to all—an international commons. In the 1970s, technology has raised anew the quandary of national versus international control. The increasing ability to drill for oil and prospect for mineral wealth in the ocean floor poses problems of sovereignty, property rights, and national interests in the allocation of rich resources among claimant nations and their nationals.

The dangers and serious problems which would result from failure to establish an orderly and equitable international system for exploiting the resources of the seabed were widely recognized at the time when the seabed study was prepared, 4 years ago. The United Nations had sponsored conferences in 1958 and 1960 to reconcile conflicting jurisdictional claims. In 1970 the U.N. General Assembly called for another conference:

> . . . this time to produce a comprehensive treaty settling all the issues that had been skirted before, and that had arisen in the interim as a result of new technological progress. The complexity of the problems overwhelmed the 2,000 delegates of 148 governments who met for 10 weeks in the summer of 1974 in Caracas, Venezuela. The same proved true of the eight-week conference [held in the spring of 1975] in Geneva. The primary disputes remain.[487]

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[486] Doumani, *Exploiting the Resources of the Seabed*, 86 pp.
[487] Richard A. Frank, "The Law at Sea," *New York Times Magazine*, May 18, 1975, p. 15.

Mr. Frank (the author just quoted) began his article with a dismal scenario and commentary—

> *Geneva.*—It is the year 2000. The coastal powers have extended their sovereignty to the centers of the oceans. Cargo and military vessels must pay tribute as they pass from one sovereignty zone to another or as they transit straits through which passage once was free. Conflict between the "have" and "have-not" countries, as governments jostle over the resources of the seabed, keeps the world in a state of tension. Fish are a rarity; the few species that survive taste rather odd, for they inhabit an element befouled by enormous amounts of pollution. In most coastal areas, swimming in the sea is forbidden by law. The contamination has killed most of the sea's phytoplankton, the primary source of the earth's oxygen. The environment needed to sustain life on earth is wearing away.

Frank commented that this picture of the world 25 years from now was simply a projection of current trends. "Four major controversies—over territorial seas and strategic straits, over the fish in the oceans, over the oil and mineral riches of the seabed and over marine pollution—have merged into the one overwhelming problem of establishing new regulations for the water two-thirds of the earth. And while all governments acknowledge that the peace of the world and mankind's very future are at stake, the powerful competing interests at work in each area of controversy have thrown the technicalities of the problem into the swirl of a multinational political contest."

Today, Frank observed, there are no effective regulations for sensible conservation of fisheries, nor against unilateral extension of national controls seaward, nor against use of the oceans as "the world's great garbage dump." He continued: "There is only a record of four inconclusive attempts since 1958 to organize for orderly use and exploitation of the seas. The last attempt, the International Conference on the Law of the Sea in Geneva, has just concluded with no agreement by the delegations on the major issues. . . . About the only clear decision was to convene yet another conference—in New York, next March." Meanwhile (he concluded), it is uncertain whether national appetites and the pressures of technological advance can be kept in check for another year. "If they can't, the last restraints may be abandoned, and with them any chance of an international solution averting the kind of situation described above." [488]

It has been said before: technology is outpacing the means of controlling it. The case of the ocean, however, is especially consequential. World peace, security, and economic and environmental well-being all urgently require the establishment of some kind of effective international regime governing exploitation of all ocean resources and the uses of the ocean.

One possibility, frequently voiced, is to vest in the United Nations the sovereignty of the oceans beyond some generally accepted offshore territorial limit. Exploitation of resources of the vast ocean commons would be by U.N.-licensed operations, with fees and a share of profits going into a fund to assist in the development process or otherwise to benefit the world community. Another possibility, raised by Harlan Cleveland among others, is to partition the oceans to adjacent states in a form of marine regionalism, with the member states of each region resolving for that oceanic region the rules and equities to apply within it. The most controversial alternative would be for those nations possessing the technology to exploit the seabed to proceed to do so, with all the complications that such a technological version of

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[488] *Ibid.*

"manifest destiny" would imply. The outcome of the problem remains in doubt, although substantial progress toward a comprehensive treaty was made in the spring 1976 session of the United Nations Law of the Sea Conference in New York. Whatever it proves to be, it will have great significance for the supreme global issue of striking a workable balance between independence and interdependence.

CASE SIX: U.S.-SOVIET COMMERCIAL RELATIONS

Much has happened in United States-Soviet commercial and political relations in the short time—hardly more than 2 years—since the Hardt-Holliday study[489] was prepared. However, in the context of interdependence the study seems more relevant and timely than ever.

A basic question raised in the study is whether the Soviet Union is prepared to operate as a participant in the international economy. Another question of more direct and immediate significance for the United States is whether the Soviet Union is ready to shift resources from a continuation of the arms race in order to use its role in the international economic system to benefit consumers within the U.S.S.R. A third question that has emerged since the study was published in 1973 is whether the United States is prepared to facilitate such changes of direction by the Soviet leadership.

A significant statement was made in the study regarding the possibility that closer United States-Soviet economic relations might "unleash irreversible forces of constructive change which could, in turn, contribute to international interdependence and stability." Moreover, transactions resulting from relationships established by U.S. agribusinesses and by the U.S. oil and gas industry with their Soviet counterparts might prove substantial, but "political gains might far outweigh the relatively modest economic returns."

The statement was preceded by caveats and a balancing of political costs and risks against foreseeable or likely political benefits. These were then summarized in relation to likely economic gains to the United States:

> The volume of Soviet trade with the United States by any projection is not likely to represent a large share of U.S. trade or GNP. Economic advantages to the United States are likely to be centered on such specific sectors as imports of petroleum and natural gas, and exports of soybeans, feed and cereal grain, and computers, and other high-technology products. The balance of payments deficit of the United States and our program for expanding the export of high technology may receive benefits which are, at best, only marginal compared to those which may derive from potential changes in economic relations with non-Communist countries.
>
> At the same time, if the Soviet Union should reorder its priorities and permit more foreign decisionmaking involvement in domestic cooperative ventures, significant long-run benefits of a predominantly political nature might accrue to the United States such as: (a) the potential reduction of the Soviet threat to our security from reordered Soviet priorities; (b) a degree of Soviet acceptance of the international system, implied by the U.S.S.R.'s permitting domestic involvement of foreign corporations as partners; and (c) political advantages inherent in increasing international commercial and financial intercourse. Overall, such political gains might far outweigh the relatively modest economic returns.[490]

The concept of interdependence is given concrete meaning by the establishment and growth of institutions, relationships, and procedures for coping with it. The eventual development of United States-Soviet commercial relations as both engine and expression of détente was foreseen as a possibility a quarter century or more ago by some of the same political leaders who were responsible for charting the U.S. course in the cold war.[491] The prospect was then largely speculative and hedged about with many qualifications. Vincent P. Rock's analysis and prescription of 1964 in *A Strategy of Interdependence* was reasoned and constructive, but it too was ahead of its time. Events have since caught up, and *U.S.-Soviet Commercial Relations* could address some real, if hesitant, developments toward the establishment of United States-Soviet ties with constructive implications for global interdependence. The management of these ties in such a way as to fulfill their constructive potential, however, presents many unresolved problems in the organization of the U.S. Government (including the question of executive-legislative relations), and the formulation of appropriate U.S. policies, for carrying out a global "strategy of interdependence."

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[489] Hardt and Holliday, *U.S.-Soviet Commercial Relations*, 105 pp.
[490] *Ibid.*, pp. 73-74.

ISSUE ONE: THE EVOLUTION OF INTERNATIONAL TECHNOLOGY [492]

Technology is "a powerful force—perhaps the most powerful of all forces" [493]—for growth and change in the world. A principal aim of *The Evolution of International Technology* was to document the interrelationship of technology and diplomacy. Technology was seen as both an ingredient of the conditions which call upon diplomacy and a source of diplomatic strength:

> The objective of diplomacy is to reconcile or resolve issues and establish agreements to advance the national interest in a constantly changing world. Changes within the jurisdiction of each member of the world community alter its relations with others. No source of change is more potent than an alteration in a nation's technological condition. It produces changes of many kinds of many levels of impacts and interactions: military, commercial, cultural, political, and scientific; these changes involve many agencies of government, the academic world, private business, and the public at large. Familiarity with technology, and with the nature of its impacts, is thus an indispensable tool of the diplomat. Moreover, the skill with which a nation manages and advances its own technology contributes to the status of its diplomats, and to the options with which they can negotiate. In both senses, national technology confers diplomatic power.[494]

Developments in U.S. technology bear on the attainment of such national and international objectives as peace, reduced tension, increased trade, and improvements in the lot of the developing countries:

> Accordingly, the Department of State has a cause for concern with the health and vigor of U.S. technology, both generally and with specific reference to technological fields that can be identified as contributing most directly to diplomatic objectives of the United States. The future direction of U.S. technological advances, no less than the Nation's general level of technological competence, has far-reaching consequences beyond its borders. Of great importance also are the uses made of this burgeoning technology, and the organizational arrangements—domestic and international—for overseeing these uses. In these senses, technology is an important basis for national power.[495]

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[491] The director and associate director of this study series recall discussions in the executive branch in the late 1940s and early 1950s, involving interpretations by consulting scholars and Government analysts of the likely tendencies of the Soviet Union as the aging leaders of the revolutionary period were replaced by a generation of managers and engineers. In some of the discussions the present trend toward détente and economic relationships was predicted—though always with the proviso: "Assuming a nuclear standoff . . . ."

[492] Huddle, *The Evolution of International Technology*, 70 pp.

[493] *Ibid.*, p. 70.

[494] *Ibid.*, p. 2.

[495] *Ibid.*

The study is concerned throughout with the uses of technology to advance the national interest. As it progresses, however, the theme of interdependence commands increasing attention, both implicitly and explicitly. Nuclear weapons and atomic power, it is pointed out, have profoundly influenced the international scene in many subtle and unexpected ways. They have created the need for a deeper mutual security, opportunities for large multipurpose projects to open desert regions of the world to habitation, and a host of international agencies and activities to control and exploit this still new product of science. Space exploration has led to a similar need for closer understanding and cooperation among nations, as well as conferring prestige and power upon the leaders in this technology. The securing of various new benefits by all nations from space technology requires cooperative agreement and joint action. "Planet Earth has been shown visibly and coherently as a single unit whose artificial divisions by mankind can be ignored in the global study of weather, resources of land and ocean, and even the superficial changes brought about by industry, agriculture, and human settlement." [496]

Programs in technical assistance, international activities in education and health, exchange of technical information about transportation, communications, and power, all provide a basis for closer relations among governments and individuals. Even primarily domestic technological programs are found to have significant international aspects. Some aspects of domestic infrastructure are themselves taking on an international character, such as air transportation and satellite communications. "These can serve both to help and hinder the work of the diplomat: While information can now be transmitted virtually instantaneously, to facilitate long-range bargaining, the time available for decisionmaking has decreased. The traditional conduct of secret, official diplomacy tends to be nullified by radio and television propaganda and by educational, cultural, and scientific exchanges. Swift transit of trouble-shooting negotiators to points of tension by air transport or for consultation with national leaders is counteracted by the ability of trouble-makers and dissident groups to use these same means of travel." [497]

Although particular technologies are not international in the relatively uninhibited and nonpolitical way that scientific developments are international, and although in the short run they may often play the role of powerful servant of nationalism, in the longer run they tend to affect all nations:

> Examination of the history of a number of fields of technology has demonstrated the tendency for technology to cross national boundaries, to generate problems involving many nations, to offer opportunities for general global benefit, and to effect profound changes in the world scene for better or worse. Perhaps the most significant fact about technology is this force for interdependence among nations.
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> The philosopher, Kant, proposed the "Categorical Imperative," an ethical principle to govern human behavior. It postulated that man should "Act as if the maxim from which you act were to become through your will a universal law." In other words, one should inquire of his actions as to what the effect would be if everybody did them. Perhaps the same principle warrants examination as applied to nations. Are there some general principles governing the development, application, and sharing of technology that should be incorporated in a Technology Treaty? [498]

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[496] *Ibid.*, p. 41.
[497] *Ibid.*, pp. 41–42.
[498] *Ibid.*, p. 66.

Finally, there is the vastly complex problem of how to accommodate the national interest to the growing demands of interdependence:

> Excellence in technology serves to establish a new measure of a nation's leadership within the community of nations. At the same time, it affords a means by which all nations can progress toward their own internal goals of reducing human hardship and enlarging human opportunity. How are these two effects of technology to be reconciled? What policies and what compromises are suggested for the United States, to optimize the benefits and minimize the adverse effects of technology within the United States and globally? [499]

It is difficult to escape the conclusion that part of the answer must lie in new institutional approaches providing for more thorough policy analysis, technological assessment, and long-range planning efforts at both national government (including legislative branch) and international organization levels.

ISSUE TWO: THE POLITICS OF GLOBAL HEALTH

Public health is among the least controversial and most acceptable of activities in which modern nations cooperatively engage. Even in the earliest stages in the development of international programs to control the spread of infectious disease, national interests tended to be subordinated to the general good of all peoples. A tradition of interdependence, established early, has been reinforced by modern technologies of intercontinental travel and communications. Although it is still not uncommon for the more backward nations to assert their independence by concealing evidences of diseases like cholera for reasons of national pride or trade advantage, most nations today promptly share experiences with disease control methods and diagnostic technologies. Global health is a universally accepted goal, and bits of national sovereignty are yielded up to advance it.

"As our consciousness of the world as a 'global village' intensifies," wrote Congressman Clement J. Zablocki in the Foreword to the study,[500] "we are increasingly aware of the dangers and opportunities involved when traditional values of time and space are no longer relevant. The field of global health exemplifies both dangers and opportunities." To this note the author of the study, Dr. Freeman H. Quimby, added in his Introduction: "The degree of freedom enjoyed by Americans from epidemic disease is the result of many steps taken by physicians and statesmen [in all parts of the world] over many decades, toward improving global health conditions." He continued:

> Nothing is more international than disease. It recognizes no political boundaries and few natural ones. It moves freely across national frontiers and spreads as conditions permit from one area to another. The picture usually drawn is that of great pestilences moving from backward regions to the more modern countries. But disease can also go the other way, as shown in numerous accounts of aboriginal populations' becoming infected by the customary diseases of the missionary, trader, explorer, and traveler. If one extends the problem to include the diseases of plants and animals, there is little doubt today that pathogenic organisms themselves are either already globally distributed or can rather rapidly become so. However, large numbers of these organisms, and the diseases which they cause, remain largely sequestered in regions where unsanitary conditions and certain insect vectors prevail. These conditions are the reasons for the generally endemic

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[499] *Ibid.*, p. 70.

[500] Quimby, *The Politics of Global Health*, 79 pp.

> nature of such diseases as cholera, malaria, and plague in the less developed countries. [501]

and further,

> Preventive medicine, like disease, is inherently international. Had there not been the problem of preventing the entrance of disease from one country to another and of controlling the spread of disease within countries, preventive medicine would not have developed as early as it did. Public outcry demanded that corrective measures be taken against recurring epidemics based upon the observed association between polluted water and disease. Thus was born the first phase of preventive medicine—sanitary engineering and public hygiene.[502]

The study calls attention to an opportunity for the United States to exercise a leadership role in an exceptionable cause—strengthened support of the programs of the World Health Organization. The idea suggests the further thought that there are other subject areas in which the United States could contribute in a concrete way, yet with relatively little cost and effort, to the emergence of a more manageable global interdependence. It would also share in the ultimate benefits—as in this case, the benefits of improved health conditions [503]—and would be taking a modest step toward establishing a new kind of leadership.

ISSUE THREE: BEYOND MALTHUS

The food/population balance encompasses probably the most extensive and difficult complex of issues with which present-day diplomacy has to contend. National sensitivities are deeply involved in it. Many countries which have an excess of people over food and therefore an inherent need of interdependence cling to an independent posture with respect to both aspects of the issue. They seek aid without strings from countries with food surpluses, at the same time resisting external pressures to adopt population control measures. In these respects, an attitude of independence predominated over that of interdependence at both the World Population Conference (Bucharest, August 1974) and the World Food Conference (Rome, November 1974).

Meanwhile, the global imbalance between population growth and lagging food production is worsening. The study by Dr. Nanes [504] concludes (and it is in general widely accepted) that the growth of world population is outpacing food production, while available techniques are not being applied in such a way as to improve agricultural production and marketing efficiency enough on the one hand, or to slow the rate of population increase on the other.

"Achievement of a global balance of food and population calls for many explicit improvements in political, economic, social, and diplomatic organization and management to achieve stronger human motivation, to improve the acquisition and dissemination of pertinent information, and to design and implement coordinated social programs which can apply existing technology more effectively. Without all of these, the goal of balance will continue to recede with results that seem likely to be tragic." [505]

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[501] *Ibid.*, p. 3.

[502] *Ibid.*

[503] According to an article in the *Washington Star* for September 29, 1975, WHO officials are now predicting, the total, worldwide eradication of smallpox by early 1976. When assured, this development—besides signifying the end to one of history's most dreaded scourges—will eliminate in the United States and elsewhere the necessity for the familiar smallpox vaccination.

[504] Nanes, *Beyond Malthus: The Food/People Equation*, 96 pp.

[505] *Ibid.*, p. 1.

Dr. Nanes also points out that as important as the relationship between food and population is, and whatever solutions may be found to the many-sided problem of the food-population imbalance, this problem cannot be separated from the total process of development. Development is a "seamless web." [506]

> Finding a solution to the food/population dilemma is the central problem of international development. It is interwoven with every other aspect of development. . . . for the new agricultural revolution to make its most forceful impact, there must be . . . a market economy.
>
> . . . domestic production helps establish sufficient purchasing power . . . so that the additional food produced by the new methods can be bought at prices high enough to make it worthwhile for the farmer to utilize the new technology. This process requires economic growth on a broad scale; "The tremendous interaction and interdependency which exists between agriculture and other sectors on both the demand and supply sides makes it impossible to separate the problem of food production as such from that of overall economic development." [Quoted from the summary report of the National Academy of Engineering's "Symposium on the Food-People Balance," Panel on Interactions between World Food and World Population, Washington, D.C., April 29, 1970, p. 4.] [507]

Among the factors which complicate the process of achieving overall economic development are the dangers of ecological overstress on food-producing systems [508] and limitations or imbalances in the supply of energy for motive power and fertilizer production. Recognition of the importance and pervasiveness of these factors has increased markedly in the 4 years since the study was prepared. They call attention to another meaning of interdependence: the interrelationship and interaction among global problem areas as such. Population growth is dependent on food production; that is dependent on market forces which include an adequate supply of fertilizer, which in turn requires energy; food production is also subject to growing ecological constraints. The population explosion in turn multiplies and aggravates the other problems upon whose solution it depends, and in the process adds further complexities and uncertainties to the management of interdependence among peoples.

Reference was made earlier in this essay to the growth-no growth dilemma of the future. Of all the factors which might combine to speed the day when that dilemma must be faced, expanding population is the most potent. The study is explicit on the growth-no growth problem:

> Rationally, men can already perceive the adverse human consequences of overpopulation. But there is a countervailing recognition that there are also adverse consequences of a stable population. Population growth in some instances is a powerful engine of economic growth and expansion. The developed countries have not yet accepted the consequences of a steady state either in the numbers of their population or in their industrial productivity. The alternatives that face mankind today are growth or no growth, and either one presents its problems. The logic of the situation is that soon or late mankind must accept the limits of the physical world. In a finite world, infinitely continued expansion is an impossibility. The next question is whether there is at any given time an optimum size of global population. (And indeed, also, an optimum level of affluence!) If growth in numbers must stop, then when would be the best time to stop it? By what criteria is this decision to be made? Is it the same decision for all countries? Is the final result the same for all time? And, how is the decision to be reached and then given practical effect? [509]

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[506] *Ibid.*, p. 2.

[507] *Ibid.*, pp. 51-52.

[508] For a discussion of this subject see: Lester R. Brown, *By Bread Alone*, published for the Overseas Development Council, New York, Praeger Publishers, 1974, pp. 45-57.

[509] Nanes, *Beyond Malthus: The Food/People Equation*, p. 93.

It would be difficult, the study implies, to exaggerate the importance of the interrelated problems of food and population, and the challenge which they present to diplomacy—or the difficulty of seizing the problem:

> Clearly, the two global tasks of producing enough but not too much food to feed the world's population, and providing incentives and means for the world's population to hold itself within reasonable bounds, are a tremendous challenge for modern diplomacy. The rewards of success are less impressive than the terrible consequences of failure. There is a regrettable tendency on the part of mankind to respond eagerly to rewarding opportunities, but to ignore the prospect of misfortune and delay action to avert it until convinced of its reality by its actual onset.[510]

Is the food/population balance receiving the kind of attention on the part of the U.S. Government, the United Nations, and the other individual nations of the world which a problem of this magnitude demands? Certainly concern is more widespread than at any previous period in history, and it is a key consideration in current U.S. aid to developing countries. Although two world conferences, one on population and the other on food, were held under United Nations auspices in 1974, measures undertaken to date have barely touched the edge of the problem. New approaches may be called for. How can individual countries be persuaded to accept the need for worldwide, interdependent action in setting population and food production and distribution goals in such a way as to benefit all? What additional data and analyses of future demographic problems in different areas could be furnished to all countries as a United Nations service?

How far might it be feasible to go toward establishing U.N. food/population planning and advisory facilities? Would a regional approach to population planning, in conjunction with food production and distribution measures, help avoid some of the pitfalls of either bilateral assistance or U.N. planning on a worldwide scale? Are there bold and farsighted initiatives which the United States could take now in addressing this paramount problem?

ISSUE FOUR: U.S. SCIENTISTS ABROAD

The relationship of scientific exchange to global interdependence is implicit throughout this study,[511] and occasionally explicit in particular connections: e.g., in mention of bilateral agreements with the Soviet Union and the countries of Eastern Europe as serving both science and diplomacy "by forging continuing working relationships and a degree of interdependence between the citizens of ideologically disparate states." [512]

In hearings before the House Committee on Science and Astronautics, Subcommittee on International Cooperation in Science and Space, in May 1971, Herman Pollack (speaking as director of what was then the Bureau of International Scientific and Technological Affairs of the Department of State) cited the following as among the objectives of U.S. foreign and international scientific and technological programs:

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[510] *Ibid.*

[511] Kneso, *U.S. Scientists Abroad: An Examination of Major Programs for Nongovernmental Scientific Exchange*, 163 pp.

[512] *Ibid.*, p. 1.

> a. *To advance the world's store of knowledge by free exchange of ideas and data* (e.g., International Decade of Ocean Exploration);
>
> b. *To create a "critical mass" of intellect and/or instrumentation in attacking common problems* (e.g., Global Atmospheric Research Program);
>
> c. *To speed the solution of critical problems by task appointment or complementary research* (e.g., safety vehicle development, U.S., Italy, Germany (CCMS));
>
> d. *To meet the need in many studies of simultaneous or coordinated observations for many sites* (e.g., World Weather Watch);
>
> e. *To compare the effects of geographic, climatic, cultural, etc. variables on a target system under study* (e.g., International Biological Program);
>
> f. *To avoid unnecessary duplicatory research by information and personnel exchange* (e.g., Medlars Information Exchange);
>
> g. *To make available to scientists everywhere unique resources or experimental conditions otherwise available to only a few* (e.g., SEATO Cholera Research Laboratory, Pakistan);
>
> h. *To develop international "banks" of scarce materials* (germ plasma, microorganisms, geological samples, etc.) for the use of all scientists (e.g., Lunar rock study program); and
>
> i. *To concentrate the talents of many nations on a transitory phenomenon* (eclipse, volcanic eruptions, etc.) *to provide maximum scientific benefit* (e.g., International Task Force at Mexico solar eclipse.)[513]

Besides these scientific and technological objectives, Pollack separately enumerated political, national security, economic, and humanitarian objectives. Virtually all of these have implications for interdependence, many of them quite directly—such as "To reduce tensions and rivalries between countries by utilizing science and technology for common goals and mutual benefit (e.g., U.S.-Mexico Desalination Cooperation)"; "To provide for mutual security by devising reliable methods for ensuring compliance with treaty obligations (e.g., international nuclear safeguards)"; and "To provide networks for early warning systems (hurricanes, tidal waves, etc.) (e.g., Tsunami warning system)."[514]

The study brings out an interesting point about the relationship between government and science. Although (as noted in the IGY study) scientists tend to be international and nonpolitical in their orientation, there are in fact varying degrees of interdependence—to use the word in a more limited sense—between them and their governments:

> U.S. scientists, like their counterparts in other fields and in other countries, play pivotal roles in determining both the content and mechanics of foreign and international scientific programs. In a similar manner, the objectives of these activities—the scientific goal of systematically accumulating knowledge about man and his world, and the political goal of forging closer relationships among states—necessarily vary with the way the diplomat uses science and the way the scientist views his diplomatic role.[515]

Knezo further suggests that scientists participating in ostensibly nonpolitical international scientific activities may often, in effect, be given political missions. She cites an observation by Jean-Jacques Salomon with regard to the scientists who attend the privately sponsored Pugwash Conferences that "the compliance of governments toward them is in no way absent from the calculation. In fact a reading of the lists of participants in the Pugwash Conferences is enough to pick out the names of the scientists or political observers who are officially or unofficially linked with political decision-making bodies, whether in the East or West." [516]

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[513] *Ibid.*, p. 14.
[514] *Ibid.*, pp. 13–14.
[515] *Ibid.*, p. 14.

Carried too far, this symbiotic relationship between science and government may be self-defeating. The author quotes Dr. T. O. Jones, director of National and International Programs, National Science Foundation: "It has been my experience in dealing with international science activities over the years, that whenever one contrives a scientific program purely for the purpose of political advantage or motivation it frequently fails, because the science is contrived and not genuine, and is not really of interest to the scientific community." [517]

Although scientific exchanges tend in general to have the effect of promoting interdependence, they result from mainly nationalist motivations. Thus, although the administration in recent years has inclined somewhat more toward the multilateral approach, traditionally it has had a marked preference for bilateral agreements, as has the Congress. Paradoxically, however, the United States has not sought to benefit systematically from the exchanges or—what would be more to the point—to establish parallel bilateral programs centering on technology. (As noted in the Brain Drain study, it has instead inadvertently gained by attracting technologically trained human talent from other countries, especially physicians.) Such programs might further legitimate U.S. independence interests through the import of technologies developed in other countries, in subjects in which U.S. industry is less advanced.

ISSUE FIVE: BRAIN DRAIN

This study [518] deals with the problem of talent migration—essentially, migration from areas where the talent, though needed, is not held in place by economic and other attractions, but is drawn to where it is less needed by the prospect of financial and other rewards.

The relationship of the brain drain issue to the question of independence versus interdependence focuses on the fact that the sum of trained intelligence is a global resource. The problem is that like almost every other resource it is unevenly distributed. And the problem is compounded by the extent to which human mobility across national boundaries is unrestricted. There is thus a tendency on the part of donor states to view the brain drain in international terms—a problem of interdependence calling for common efforts at solution—while the states attracting the talent tend to see it as a national problem—a failure on the part of donor states to make themselves attractive to those persons who desire to leave.

Of all the resources which contribute to the building of a civilization, the trained human mind is the most indispensable. From time to time throughout history, cultures have been strengthened, renewed, or transformed by infusions of fresh talent from outside—often deliberately induced, and sometimes massive. Thus, the Ptolemies made Alexandria a center of learning by attracting the best brains of Greece, and during the Middle Ages in Europe the spread of learning was facilitated by mass migrations of scholars in search of greater intellectual freedom and material rewards.

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[516] *Ibid.*, p. 15.
[517] *Ibid.*
[518] Whelan, *Brain Drain: A Study of the Persistent Issue of International Scientific Mobility*, 272 pp.

Human brainpower—especially the skills of mind and hand working together—is also indispensable to the balanced development which is a goal of the United Nations today. However, unlike other resources, human brainpower has built-in mobility; persons of talent tend to seek out the best conditions in which to live and work. The international migration of talent has been a widespread practice historically, despite attempts of governments to dissuade highly educated or skilled persons from leaving their domains; today the right of free movement is a widely accepted principle in the non-communist world.

But unplanned talent migration has its societal disadvantages. For example, it was pointed out in the Global Health study (Issue Two) that half the world's people have access to no health care at all. The negative implications of this potent fact, both for global health and for balanced development, are greatly out of scale with the small investment which the public health/preventive medicine approach, as contrasted with the private/curative, requires to reach large masses of population. Yet, as the Brain Drain study shows, thousands of physicians from less developed countries annually enter private medical practice in the United States.[519] The process represents a diminution of development aid where augmentation is needed; the effect is a kind of reverse technology transfer.

There is a double irony in the fact that the United States, which invented the highly effective institution of the county agent for the transfer of agricultural technology, has had minimal success in applying this technique in aiding less developed countries and has been immoderately, if inadvertently, successful in attracting talent from the aided countries.

This reverse aid, moreover, has substantially offset the benefits of U.S. aid to those countries. Dr. Whelan observes that the brain drain thereby contributes to the widening development gap between rich and poor countries, which "constitutes a potential threat to U.S. national security. This threat arises from two sources: (1) the increased likelihood of confrontation between rich and poor caused by political, economic, and social differences; and (2) world competition for vital mineral resources, the main sources of which are located in the LDCs." [520] Further: "As the requirements of interdependence press in upon the Nation's security interests, a national policy choice may compel reengagement on the broader scene of international development. Meanwhile, as this study points out, the Nation is not without recourse in providing at least some remedies for the brain drain." [521]

In his address of September 1, 1975, to the United Nations General Assembly on "Global Consensus and Economic Development," Secretary Kissinger pledged that the United States would "contribute to, and actively support, the new United Nations revolving fund for natural resources. This fund will encourage the worldwide exploration and exploitation of minerals, and thus promote one of the most promising endeavors of economic development."

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[519] *Ibid.* See especially pp. 79–80.

[520] *Ibid.*, pp. 257–258.

[521] *Ibid.*, p. 267. The remedies are discussed on pages 208–229 of the study. In speaking here of "reengagement" the author is referring to an earlier comment (p. 266) on "the indifference and apathy which characterize the Nation's [current] response to development problems that specialists insist can be managed only within the framework of an actively pursued policy of interdependence."

It has been noted that no resources are more important to the development process, and to technology transfer in general, than is human talent. For the most part, little systematic attention has been given to that fact by the U.S. Government. U.S. Scientific Attachés are not directed to observe and analyze the level of technical achievement in various disciplines or technologies in the countries in which they are stationed.[522] U.S. aid programs have suffered from lack of knowledge and understanding of the appropriate level of technology required by the receiving country, and have tended to aim too high. The unresolved problem of the brain drain further testifies to U.S. failure to take sufficient account of the role of trained human resources in development.

"The United States proposes that 1976 be dedicated as a year of review and reform of the entire U.N. development system," Secretary Kissinger stated in the same address. Perhaps, as an element in that reform, consideration might be given to encouraging and assisting the United Nations to establish a country-by-country inventory of available and needed human resources to parallel the revolving fund for natural resources. (Even for the United States no such inventory exists; a partial effort by the National Science Foundation to maintain one—the National Register of Scientific and Technical Personnel—was terminated several years ago.) Along with the inventory, provision might be made for setting up an international pool or registry of persons with needed technical and managerial skills, providing suitable rewards and recognition, and enrolling qualified persons who are willing and able to go wherever they are most needed.

ISSUE SIX: SCIENCE AND TECHNOLOGY IN THE DEPARTMENT OF STATE

This last of the 12 studies in the series on "Science, Technology, and American Diplomacy" is the most focal of the studies, in that it examines the institution principally responsible for integrating the substance of U.S. foreign policy with the conduct of U.S. diplomacy. Addressing the theme of "Science, Technology, and the Growth of Interdependence," it cites the technology of the atom as responsible for a conversion of diplomacy into new directions:

> The Congress appreciates fully the magnitude of the discontinuity that science and technology have injected into the stream of history, beginning in 1945 with the first atomic bomb and later confirmed with thermonuclear-tipped ballistic missiles launched from silos or submarines. These developments have made general war with its nuclear implications seem an exercise in suicidal folly, thereby undermining the military power base of diplomacy and enormously complicating the practice of that obscure art.[523]

At the same time, technology has forced the nations of the world into closer contact by many means, such as:

—Instant communication and visual reports at great distances;
—Unlimited recording and rapid manipulation of data;
—Photographic surveys of the total area of the Earth;
—Man-made nuclear energy;

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[522] Huddle, *Science and Technology in the Department of State*, p. 64.

[523] Huddle, *Science and Technology in the Department of State: Bringing Technical Content Into Diplomatic Policy and Operations*, 180 pp. (pp. 1–2).

- —Global weather prediction;
- —Cheap synthetic substitutes for many cash crops;
- —Chemicals and drugs with global social and environmental impacts; and
- —Massive and rapid air transportation.

No nation, it is pointed out, has been subject to more extensive technological alterations in its culture or economics than has the United States, as measured by:

- —The substitution of machine power for manual power in homes and work places;
- —The move from field, forest, and mine to offices and service occupations;
- —Personal transportation, communications networks, and computer services; and
- —Consumption of fossil fuels and industrial materials.

As a result of these technological developments, the United States has increased its dependence on foreign sources of energy, materials, and industrial products, while other nations have increased their dependence on the United States for food, educational facilities, technical assistance, and economic stability. "As a consequence of technology, the United States has led the world in bringing about a global structure of international interdependence."[524]

A major theme of the study is that despite this leading role the United States is not well organized to cope with interdependence.[525] Traditional habits of thought and action persist in organizational structures and procedures which tend to emphasize bilateral over multilateral relationships and one-dimensional approaches to international problems over multidimensional.

Paralleling the growing interdependence among peoples, the study emphasizes, is the growing interconnectedness of different kinds of diplomatic problems:

> A feature of the world scene of today is the complex way in which so many of the great global problems intersect. Materials shortages raise questions of political jurisdiction over the deep seabed. World food shortages relate to fertilizer supply, which is tied to energy and petroleum, materials cartelization, weather modification, and water supply. Energy relates to petroleum and world distribution of coal, but also to nuclear power generation, which involves international technology transfer, the environment, nuclear safeguards, and safe disposal of nuclear wastes. Space utilization involves searches for materials, global communications, detection of agricultural blights, and information management. In fact, directly or indirectly, most of the large technological issues facing the world of the future in 1975 appear to be closely interconnected. . . .
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> The implication of this demonstrated interconnectedness among international technological issues is that organizations cannot operate effectively if they are limited in scope to a particular function or issue. Coordination is essential to ensure that each mission organization, national or international, does not operate at cross-purposes with other organizations with other related missions. In the United States this coordinating function on international technological issues and functions is the responsibility of the Department of State. There does not appear to be any clearcut assignment of corresponding responsibility for coordinating international mission agency functions. Moreover, there does not appear to be any extensive discussion of the need for such international agency coordination. And, indeed, the extent to which the U.S. Department of State is organized, equipped, and manned to coordinate U.S. aspects of these functions and issues is open to serious question.[526]

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[524] *Ibid.*

[525] Others, of course, have made this point, and some have explored the question of what might be done about it. An example of an unofficial inquiry by the "National Commission on Coping with Interdependence" is footnoted earlier in this essay. Two recent official examples are the study by Bloomfield *et al.* for the State Department and the Murphy Commission study, both also mentioned earlier. Chapter 10 of the Report of the Murphy Commission suggests organizational concepts and procedures necessary for "shaping an international order or managing interdependence. . . ." The substance of this chapter is discussed at length in the essay to follow, on "Short-Range versus Long-Range Planning." See pp. 334-341.

[526] Huddle, *Science and Technology in the Department of State*, pp. 149-150.

In this connection the author cites a 1973 study by a panel of the United Nations Association:

> The United States Government [like American society as a whole] is increasingly part of an interdependent world, but its organization and procedures still reflect earlier, simpler times when nation states could on most matters safely deal with each other at arms length and through career foreign services. In today's world, international relations are of necessity pervasive, technical, continuous, and intimately involved with domestic issues, and this requires new styles and new systems of governmental organization and process, which rely far more than in the past on a wide range of professional participation in policymaking.
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> Compared to the resources lavished on management improvements in a single large multinational corporation, those being devoted to the far more important and difficult problems of improving the organization of the government in a multinational setting are pitiful. (United Nations Association of the United States of America, National Policy Panel, *Foreign Policy Decisionmaking: The New Dimensions*, New York, UNA-USA, May 1973, pp. 101–102.)

Among other things, the UNA panel report noted, "little in FSO diplomatic training prepares them for . . . diplomacy in multinational forums." Yet ever since World War II a substantial and increasing part of the diplomat's responsibilities has concerned multilateral matters. Harlan Cleveland comments in 1975 that:

> In the late '60s, when I had occasion to visit every US mission in NATO Europe, I made a point of asking what proportion of the business on each Ambassador's desk was strictly bilateral business, and what proportion was essentially bilateral conversation about business done multilaterally. My estimate at the time was that the multilateral content of bilateral diplomacy ranged between 60–75%; now, half a decade later, the average is probably at the high end of that range. Some idea of the pervasiveness of multilateral processes can be derived from the sheer numbers of meetings held each year. The United States Government was officially represented at 740 international conferences last year, and several thousand private international meetings engaged the attention and attendance of private American organizations.[527]

Cleveland's analysis of the shortcomings of the State Department and of the U.S. Government roughly parallels that of the present study. Stating that "the organization of our Federal Government for the management of international affairs is still based on . . . assumptions which are quite inconsistent with the facts of international life," he comments that the Government is unambiguously divided between "domestic" and "foreign" affairs and that the management of "foreign affairs" is heavily weighted toward the administration of bilateral relations with other countries. "Because most of the talent is thinking and working on bilateral relations, officials . . . have been mostly unavailable to grapple effectively with the U.S. defense budget, CIA operations, energy, population or food. . . . Planning for major world conferences (Stockholm on environment, Bucharest on population, Rome on food, the Special U.N. Assembly on a "New International Economic Order") tends to be late and ragged . . . there is not nearly enough room in the foreign policy establishment for strategic long-range planning, especially on the widening range of "interdependence issues."[528]

Science and Technology in the Department of State examines departmental weaknesses in detail and suggests a number of options for improvement.[529] Both Cleveland and Huddle offer suggestions for strengthening congressional capabilities, as well as those of the executive branch, to meet the new requirements of interdependence.

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[527] Harlan Cleveland, *The Management of Multilateralism*. A paper prepared for the Commission on the Organization of the Government for the Conduct of Foreign Policy (the Murphy Commission), Princeton N.J., Aspen Institute for Humanistic Studies: February 3, 1975, 35 pp. (p. 7).

[528] Cleveland, *The Management of Multilateralism*, pp. 13–15.

[529] The whole study is an analysis of departmental problems and weaknesses in terms of contemporary demands. For the options, see pp. 167–176.

These requirements are for improvements not only at the national level but in the machinery of the United Nations. There is, moreover, a reciprocal relationship between the international organization and its national members with respect to both ends and means. To implement Secretary Kissinger's international development goals, his proposals for an International Industrialization Institute and an International Center for the Exchange of Technological Information, and his suggestions as to a conference on science and technology for development and other cooperative measures to achieve needed development,[330] would require corresponding structures and procedures at national levels—especially in the governments of nations best able to contribute leadership. It remains to be seen whether these steps will be taken.

A measure which could dramatize the interdependent relationships between individual nations and the United Nations, and of domestic and international interests within individual nations, might be a technology alert system for the rapid dissemination of universally needed technical information. This system could interrelate with existing services like the World Weather Watch and the health advisories of the World Health Organization, but might also embrace the entire range of technical and related social issues bearing on human security and well-being. It could address, for example, such diverse matters as detection of toxic agents in the atmosphere, prevention of the international transmission by air of insect pests, treatment of childhood diseases, the sharing of constructive experience in the social assimilation of the mentally retarded, and many others. Another effect of such a step would be to emphasize that much of what is implied by interdependence today lies outside the zero-sum formula and even outside the area of healthy competition;[331] the cost in money and effort of sharing it universally would be slight in proportion to the universal gain. Two questions remain to be asked, however: would the United States (or some other nation) sponsor such a proposal? And, if so, would it persist in providing the organizational support for successful follow-through and in stimulating other nations, and the United Nations itself, to do likewise?

Interdependence might also call for an awareness on the part of developing countries whose chief exports are raw materials that technology, no less than mines and railroads, costs money to develop. The open-handed way in which the United States has dispensed technology since 1950 in the various foreign aid programs has constituted a donation of billions of dollars without recompense. The developing nations now propose that their exports be paid for more generously and that they be given broader access to needed technology. Such proposals allege economic justice in the name of interdependence. But the arrangement would be a blatant form of nationalism, wanting in equity and not long lasting. Interdependence needs to be based on fair dealing and improved opportunity for all.

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[330] Kissinger, "Global Consensus and Economic Development," p. 7.

[331] Professor Robinson comments on this point: "As I see it, this is precisely why a fresh posture toward the idea of 'the national interest,' in order to offset zero-sum expressions of nationalism, is essential. The task of demonstrating the connection between 'the national interest' and the fashioning of a prudent, yet encompassing, fabric of interdependence is, perhaps, the most vital one that pertains to the long-term success of diplomacy and preclusion of nuclear war. In essence, I see no prospect that interdependence will be consciously and aptly treated as a mandate of nature, as the twenty-first century nears, until the concept of the national interest attains a revolutionary revision." There are, he adds, built-in psychological obstacles: ". . . major powers deem their sentiments of independence (read superiority) not lightly to be encroached upon. At the same time, less-puissant nations are disposed to parade their 'independence' as compensation for feelings of inferiority and to view interdependence *as a norm* as camouflage for the (subtly alluring) reaffirmation and perpetuation of their weaker condition. Thus, it appears to be interdependence-as-reality's misfortune that no grander or lesser power at all has much incentive to own up to the extent to which its destiny is tightly enlaced with that of other nations." Further: "Much of contemporary diplomacy appears to have the object of *manipulating* interdependencies in a way that will favor the maximization of independence. . . ."

A Concluding Remark

In the foregoing discussion the fact of interdependence is seen as generally accepted by informed persons in the United States, however inadequately its implications may be understood. And since Americans are a "can do" people, acceptance of the fact tends to carry the suggestion that appropriate steps are being taken, or will be taken, to cope with it.

But is this the case? What is the present reality? There is a possible view which has not yet been fairly dealt with; it is summarized in a recent *New Yorker* article:[533]

> . . . when one turns one's attention away for a moment from one's hopes of what interdependence may become in the future and examines what it is here and now, interdependence begins to look like the source of nothing but trouble. In fact, a large number of the crises of the last few years could be described as crises of interdependence. The oil crisis, which launched the idea on its spectacular career, is the prototype. . . . It is often debated whether the causes of the oil crisis are fundamentally political or fundamentally a matter of dwindling resources. They are, at bottom, neither. The crisis is what happens when many nations come to rely on the natural resources of a few nations for their economic survival. It is a crisis of interdependence. What can be said of oil can also be said of food. . . .
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> Unions in many countries . . . have discovered on the national level what the OPEC nations have discovered on the international level: that modern economies are fatally vulnerable and are an excellent target for blackmail. An altogether different sort of actor on the political scene—the terrorist—has learned to make use of the pressure points of modern society in another way . . .
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> What may be most dangerous of all is that interdependence makes every crisis in every part of the world the business of everybody. . . . when every small crisis in the world—so many of which seem to be entirely impervious to solution—becomes the business of everybody, then each small group that has a role to play in the functioning of the whole can hold the whole for ransom. One day, a planned interdependence may develop that will resolve these difficulties. For the moment, the unplanned interdependence that is actually with us seems only to multiply the dangers the world faces.

It would be easy, perhaps, to brush aside this counsel of near despair as the reflection of some weary and skeptical writer's overlong exposure to the troubles of New York City—the product of a unique situation. (But how unique, indeed, is that situation—or how symptomatic?) How much overdrawn, after all, is this sardonic view of interdependence? The troubles of Beirut, Belfast, Lisbon, and Buenos Aires cause repercussions around the world, and there is the danger (amounting in the minds of many observers to a certainty) that by defaulting New York City would wreak havoc on many banks in the United States and Europe.

It is hard to gainsay the phrase, "the unplanned interdependence that is actually with us." Where is the policy planning, fortified by accepted procedures for reaching common understanding with other responsible nations, to provide the context for ready solutions to even elementary problems like the problem of international hijacking, kidnapping, and terrorism? How can nations do a better job of foreseeing and heading off the larger "crises of interdependence?"

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[533] "Interdependence: On the Road to Moral Perfection?"—reprinted in *The Inter Dependent*, vol. 2, no. 8, October 1975, p. 2. Another possible view is expressed by Gregory Schmid in the Winter 1975-76 issue of *Foreign Policy*, in an article entitled "Interdependence Has Its Limits." Schmid poses the question of whether the world may not have reached the end of a 30-year period of growing economic interdependence, and may be entering "an era of new mercantilism."

Some Questions for Further Consideration

This essay has called attention to a dynamic factor in the affairs of mankind which by its very nature has extensive implications for the conduct of diplomacy and, indeed, of all human relations. That factor, expanding interdependence, is not a cause of human problems in the same primary sense that population growth and a shortage (or maldistribution) of resources are causes. Nevertheless, for any given stage of global evolution, it represents a problem in itself—a condition to be dealt with directly with the best insights that the study of anthropology, sociology, and psychology, as well as history and politics, can afford, and the utmost creativeness in social invention,[533] national and international political leadership, and international public administration.

"The world in which we live is poised uneasily between an era of great enterprise and creativity or an age of chaos and despair," declared Secretary Kissinger in his July 14, 1975, address at Milwaukee on the subject of the United Nations.[534] "[We] had better turn our American ingenuity loose on the humanistic management of interdependence—in a world where, as we willed it, nobody is in charge," writes Harlan Cleveland.[535] To which Marina v.N. Whitman adds: ". . . the replacement of leadership based on hegemony with leadership based on persuasion and compromise will be difficult, perhaps impossible. But this nation was born of an 'impossible' undertaking; and today, as two centuries ago, there is no acceptable alternative."[536] These three statements would seem to sum up the intricate web of challenges, problems, and outright dilemmas which face U.S. leaders in the executive and legislative branches today. Obviously, there are no easy answers, and many of the questions cannot yet be sharply posed. Some which seem worth raising for congressional consideration are presented herebelow:

QUESTIONS

What structural and procedural reforms might it be politically feasible and administratively practicable for the U.S. executive branch to adopt in the near future to accommodate the growing needs of interdependence? What further reforms should be planned for the future?

What reforms should the United States seek to have the United Nations adopt to the same end, now and later?

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[533] For a definition of this term see: U.S. Congress. House. Committee on Science and Astronautics. Subcommittee on Science, Research, and Development. *Science Policy: A Working Glossary*. Prepared for the Subcommittee by the Science Policy Research Division, Congressional Research Service, Library of Congress. Washington, D.C., U.S. Govt. Print. Off., July 1973, pp. 62-63. (Examples of social inventions include parliamentary procedure, mass public education, the census, the land grant university, the county agent, retirement pensions, public hygiene, the World Health Organization and other U.N. functional agencies, and the United Nations itself.)

[534] Kissinger, Henry A. "The Global Challenge and International Cooperation." Address at Milwaukee, Wisconsin, July 14, 1975. Printed and circulated by the United Nations Association of the United States of America, New York.

[535] Cleveland, Harlan. "A Leaderless World." *Washington Post*, May 18, 1975.

[536] Whitman, Marina v.N., "Leadership Without Hegemony: Our Role in the World Economy." *Foreign Policy*, number 20, fall 1975. p. 160.

What reforms might be appropriate in the Congress? For example, should the Murphy Commission proposal for establishment of a Joint Committee on National Security be adopted? What are the pros and cons of such an arrangement? Should the scope of a joint committee, if established, be broadened to reflect considerations of interdependence beyond those normally encompassed by the term "national security"—e.g., international cooperation in science and technology, and in the maintenance of global economic security and stability?

It is widely conceded that (a) interdependence is an increasingly universal and compelling fact of life today, closely tied to the processes of technological innovation, change, and growth, but also (b) that the sovereign nation-state is firmly entrenched, at least for the predictable future, as the principal instrument of growth and development. What are the main implications of this seeming contradiction?

To what extent and in what ways can the United Nations be realistically expected to moderate and direct the forces of nationalism in the interests of constructive interdependence?

Are temperate forms of nationalism to be encouraged as a means of preserving cultural variety and creativity in a world in which growing interdependence might tend to produce a sterile uniformity? How can the line be drawn between harmful excesses and differences worth preserving? How can a Hegelian "higher synthesis" be achieved in which a blend of independence and interdependence embodies the best values of both?

Is multinational regionalism a practical approach to striking a balance between constructive interdependence and the protection of valid national interests? Is the European Community or the Mekong Project a useful model of the regional approach?

Are economic alliances like OPEC potentially constructive from the standpoint of world economic security? How can the excesses of such alliances be reconciled with the interests of global interdependence and development?

How can nationalist political leaders who seek the benefits of interdependence be persuaded to assume commensurate burdens?

At a time when a growing acceptance of the reality of interdependence is accompanied by a paradoxical sense of drift and tendencies toward world fragmentation and anarchy, leaders like those of the early post-World War II period (who foresaw interdependence) are conspicuously lacking. What can be done to encourage articulate leaders with world visions to come forward—from small, as well as large, nations?

This study has shown how the technology of transport, communications, space, the seabed, global health, and atomic control has been eroding national sovereignty and bringing about the rise of interdependence. But what other forces are at work to this end? Is the multinational corporation one of them? Might the multinational corporation itself be shaped into a constructive instrument of beneficial interdependence?

What can be done, for example, to establish a code of conduct for multinational corporations that would achieve a constructive balance between the interests of private enterprise and those of interdependence?

Can a system be devised for sharing vital resources with have-not nations in accommodation with the practices of both the free market nations and those with planned economies? Is it feasible—given the consent of a sufficient number of nations with resources—to divide resources into two broad categories: those which must be shared within certain agreed limits of pressing need, and those subject to competitive exploitation? And how can the value of raw materials exports be validly balanced against the value of exports of technology?

Should the United Nations, as a long-range planning measure, consider seeking international consensus to divide the world into technological, economic/occupational, production-and-services regions—i.e., countries within subcontinents, and regions within or cutting across countries, in such a way that primary (but not exclusive) emphasis in some regions would be on heavy industry, in others on high-technology light industry, in still others on recreation and tourism—in accordance with their natural endowments and cultural preferences? If this is an impractical concept, what steps might it be feasible for the United Nations to take in the direction of planned and harmonious world development? Should a start be made by encouraging such variegated but balanced development within regions?

Would it be feasible and desirable to strengthen the modest program of United Nations Volunteers as a vehicle, in the development field, for promoting constructive interdependence? Would it be useful to emphasize the regional approach in this field also?

Might it be desirable and feasible for the United States to encourage the establishment under U.N. auspices of a futures research facility staffed by social, political, and physical scientists, technologists, engineers, and specialists in futures research and forecasting, to study and report on various growth and resource trends and their implications for balanced versus unbalanced growth and ecological overstress?

In what ways, if any, should the Federal Government involve State and local governments in problems and issues of global interdependence, as was briefly attempted during the Presidency of John F. Kennedy?

In what ways might it be useful for the U.S. Government to promote cooperative efforts among government, private enterprise, academic, and other interested elements in the United States, directed toward the solution of problems of interdependence?

What steps might it be practical and useful to take toward developing a philosophy of interdependence?

X. LONG-RANGE AND SHORT-RANGE PLANNING

In this final essay a number of themes are drawn together in an effort to suggest a broad direction for policy planning in the subject area of Science, Technology, and American Diplomacy.

A series of dichotomies have been presented—initiative/reactive, bilateral/multilateral, high technology/low technology, public/private, and independence/interdependence. In all of these Hegelian dualities the element of timing emerged as an important factor. The purpose of this essay is to deal with the question of timing. On what time scale should the United States address the problem of linking science and technology to diplomacy? Can enough aspects of the future be reliably forecast to prepare for them? Or is it better to deal with the present and let the future take care of itself? Must U.S. diplomats and Members of Congress content themselves with reacting to crises or can they plan to avert at least some of them?

Planning as a Proper Noun

Before addressing the question of the time frame, however, it is necessary to develop the rationale for planning at all. Why plan? Is planning moral? Is it expedient? Is it technically feasible? Is it politically acceptable?

It is remarkable how many different attitudes have grown up around the idea of planning. A family plans a vacation. An architect plans a house. A corporation plans a sales campaign. The retired financier makes an estate plan. Many States, municipalities, and counties have planning offices, and urban planning is a degree subject in many universities. Military planning is a widely practiced activity.[537]

What is it that is common to all of these different kinds of planning, and why do some people recoil from the idea of government planning for the future of a democratic society?

Elements common to all planning seem to be:

(a) The establishment of goals;
(b) Examination of underlying assumptions, followed by sharper focusing of goals;
(c) Definition of present status;
(d) Determination of a process or procedure for attaining the goals;
(e) Determination of the requirements of resources and effort to achieve the intended progress toward the goals;
(f) Identification of foreseeable obstacles to achievement of the goals;
(g) Establishment of the time required to achieve the goals;
(h) Division of the total time required into increments in which specific steps will be accomplished;

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[537] However, when the author of this essay wrote the Industrial Mobilization Plan, 1947, for the U.S. Munitions Board, he was instructed not to use the word "planners" but instead to use "the makers of plans." In the judgment of senior military officers at that time there was a pejorative or perhaps socialistic tinge to the word "planner," although the word "plan" was less pejorative. Even plans of the Joint Chiefs of Staff for national war emergencies were sanitized by being styled "concepts."

(i) Allocation of responsibility among the participants who will cooperate in executing the plan;

(j) Review of the total plan for completeness and feasibility, for adequacy of provisions for evaluating its effectiveness at stated intervals after execution, and for foreseeable negative impacts or side-effects of carrying it out; and

(k) Presentation and justification of the plan to those with authority to decide on its acceptance and to order that it be carried out.

There are many reasons for opposition to planning in a democratic political system. Disagreement in any of the items of (a) through (k) results in opposition to the process as a whole, and in a democratic system "no" votes tend to carry more weight than do "yes" votes. The size of the society itself implies that plans are likely to be unmanageably large in size and scope, and such plans are cumbersome and imprecise. Definition of concrete and specific goals is sometimes particularly difficult, and their acceptability is hard to attain. The planning agents and the goals they choose may be partisan, and the timing is thus linked to the electoral process rather than determined by the inherent character and requirements of the plan itself. National planning in the United States encounters one obstacle not widely characteristic elsewhere: the fact that U.S. society has a pioneer heritage and tradition in which self-reliance and individual planning takes the place of large-group planning.

In consequence, the word "planned" takes on a somewhat pejorative character when used in such terms as planned economy, planned social change, and planned redistribution of populations or racial groups. The idea of a "five year plan," as employed by the leadership of the Soviet Union, is held in general disfavor in the United States. The philosopher John Dewey, writing in 1939, observed that this usage of "planning" had led to its wide condemnation in free societies:

> What *claims* to be social planning [wrote Dewey] is now found in Communist and Fascist countries. The *social* consequence is complete suppression of freedom of inquiry, communication and voluntary association, by means of a combination of personal violence, culminating in extirpation, and systematic partisan propaganda. The results are such that in the minds of many persons the very idea of social planning and of violation of the integrity of the individual are becoming intimately bound together. (His emphasis.)[538]

But Dewey does not dismiss planning as a legitimate function of society. Indeed, he says, "Forethought and planning must come before foresight."[539] He makes an important distinction between the "planned society" and the "continuously planning society."

> The former [he continues] requires fixed blueprints imposed from above and therefore involving reliance upon physical and psychological force to secure conformity to them. The latter means the release of intelligence through the widest form of cooperative give-and-take. The attempt to *plan* social organization and association without the freest possible play of intelligence contradicts the very idea in *social* planning. For the latter is an operative method of activity, not a predetermined set of final "truths." (His emphasis.)[540]

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[538] Joseph Ratner (ed.). *Intelligence in the Modern World.* John Dewey's Philosophy. New York, The Modern Library, 1939, p. 431.

[539] *Ibid.*, p. 954.

[540] *Ibid.*, pp. 431–432.

Formal adoption of mechanisms of economic planning in the United States occurred by enactment of the Employment Act of 1946.[541] Creation of the Policy Planning Staff in the Office of the Secretary of State in 1947 gave recognition of the need for planning in support of U.S. diplomacy.[542] The need of the Congress for a planning institution concerned with the impact of science and technology on U.S. society led in 1972 to the creation of a congressional Office of Technology Assessment.[543]

However, the area of interaction between diplomacy and both science and technology has remained a kind of no man's land, insofar as planning is concerned. Bits of responsibility are distributed throughout both the legislative and executive branches, but no mechanism exists to bring a general coherence to the various planning activities. More importantly, no mechanism exists to mobilize and apply for the achievement of diplomatic goals the two preeminent strengths of the United States: technological skill and managerial expertise. Although the principle of "planning" as an abstraction seems to have won some measure of acceptance and respectability since John Dewey's 1939 definition of its democratic role, the practice and application of planning for diplomatic programs of action seem still to be awaiting some kind of further confirmation and support. The reason for this delayed acceptance may lie in the uncertainty over whether diplomatic planning should address the immediate future or the decades ahead. How indeed should American skills in technology and management be employed to prepare to solve the diplomatic problems of 1976 or 2001, in view of the many imponderables in the way? On the other hand, is it possible that those who are expert in technology and management might be able to help identify and assess these very imponderables and translate uncertainties into probabilities?

Weaknesses of Short-Range Planning

It is an oft-repeated truism of military lore that any plan promptly implemented is superior to the best plan executed belatedly. Catastrophes as well as successes have resulted from adherence to this doctrine. But even granting the virtue of speed in military tactics, there is a profound difference between military combat and diplomacy. War is a zero-sum game in which the enemy's loss equals the home force's gain; when ideally pursued diplomacy is a non-zero-sum game in which both sides win. A treaty that benefits only one signatory will not be long preserved. For this reason alone, more skill is required in diplomacy than in warfare. (The historical frequency of conflict suggests that more attention should be given to the skills of diplomacy.)

The timing of international relations planning is conditioned by the fact that the elements useful to modern diplomacy are slow in developing. They center on technology, economics, and social action.

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[541] Public Law 79-304. However, for an account of earlier planning and goal-setting in the United States see *The Evolution and Dynamics of National Goals in the United States* (U.S. Congress, Senate, Committee on Interior and Insular Affairs, prepared by Franklin P. Huddle, Science Policy Research Division, Congressional Research Service, Library of Congress, Washington, U.S. Govt. Print. Off., 1971, 5[illegible] pages. Committee print.)

[542] Huddle, *Science and Technology in the Department of State*, op. cit., pp. 88–90.

[543] *Ibid.*, p. 177.

The results are measured in terms of amicable and constructive relations with neighboring countries, shared objectives with the rest of the world, and evidences of lowered tensions generally.

Short-range planning in the diplomatic sphere tends to be action-oriented, narrow in scope, and secret. It is inherently limited in participation, administered by an exclusive elite, and accordingly, when disclosed, is likely to elicit criticism from nonparticipants. Such criticism can be based on the fact that the values of competing alternatives to the plan adopted are readily perceived by the outsiders, while those conducting the planning have insufficient time for assessment of these alternatives and tend to be committed to their own chosen course. Thus there is an inherent divisiveness in short-range planning for diplomatic programs. Above all, there is no time or opportunity to win consensus in support of the plan adopted.

Another weakness is that short-range planning tends in its approach to be reactive, rather than initiative. The weaknesses of the reactive mode in diplomacy were discussed in a previous essay. Anticipating all the possible actions and trends in other countries that are likely to require U.S. response, and designing such responses, tends to overload the planning and decisionmaking structures.

A great danger in short-range planning is that the execution of a reactive plan conceived in haste with narrow participation can set in motion a chain of circumstances that becomes progressively and irresistably disadvantageous.

Finally, there needs to be taken into account the special problem of the conduct of diplomacy in a country with a democratic tradition, universal suffrage, and a popularly elected leadership. Education of the electorate to the evolving needs of the Nation for diplomatic change, overcoming localized or specialized pockets of resistance to otherwise popular courses, and achieving a general understanding and acceptance of proposed diplomatic programs, can be impossible in a short time frame.

Difficulties Imposed by Extended Time Frames

Long-range diplomatic planning is not without its obstacles. Plans need to take into account the circumstances at the time they are to be implemented; the more extended the time frame, the more uncertain the circumstances will be. Public attention may wander if the issue in question is perceived to be of insufficient moment or if there are conflicting demands for public notice. A program long in development can lead to entrenched positions in conflict, with resultant indecisiveness and inaction. Then, too, the leadership may grow impatient and resort to quicker, if less promising, alternative solutions, expecially when sensing the political necessity to produce a diplomatic success for the public. Even when a diplomatic initiative has been well planned and effectively implemented, there is a danger that the leadership, having scored one diplomatic success, will feel the need to sustain the momentum by a following succession of related action, each less carefully prepared than the initial stroke. Plans long in maturing are, of course, unlikely to remain undisclosed and when they assume a change in future normative values they can give rise to great controversies. For example, had the Department of State undertaken a study in 1950 of the desirability of recognizing the People's Republic of China or acceptance of the de facto Soviet hegemony in Eastern Europe, severe criticism might well have been expected.

Fundamental Virtues of Long-Range Diplomatic Planning

Still, the planning of national diplomatic measures on a very long time scale has many advantages. Plans thus developed can be broad in scope, comprehensive, and durably massive in effect, rather than merely clever or transient. They can be exposed to much critical analysis in the course of their development to eliminate minor flaws and revise incorrect assessments. Designs can comprehend more aspects, phases, interfaces, and complications. The planners can bring to bear a larger participation of relevant technical expertise as it is needed. Open public discussion and debate can enable broad public understanding and acceptance.

From the point of view of the diplomatic community there are advantages in the slow, deliberate evolution of a plan: quick decisions on important matters involve elements of risk uncongenial to the diplomatic style.

From the point of view of the technical community the long-range plan has the advantage of allowing time to perfect technological initiatives consistent with the broader diplomatic concept, based on initial study of requirements for new technologies, and refined in response to study of the effects of their deployment. Technological development itself has its own built-in time frame.

From the point of view of the Congress the long-range plan has the advantage of efficiency and effectiveness because such planning is able to exploit those qualities in which the United States is strongest and most admired: technological superiority and skill in administrative management.

Not only does the slow unfolding of a long-range diplomatic plan help to build a national consensus within the United States; it also permits adjustment and revision to satisfy the differing needs and views of other world powers as the planning process matures. In addition, the slow evolution of broad diplomatic plans provides time and opportunity for collaboration on a multilateral basis by many other nations sharing the goals and aspirations on which the plans are based. (Weaknesses of diplomatic organization based on a multiplicity of bilateral agreements or programs were discussed in an earlier essay.)

Long-Range Planning Aspects of the National Security

There is an emerging dilemma as to the nature of war and national security in a world of nuclear-armed superpowers. Nuclear weapons are manifestly a product of technology. So are the high-precision subnuclear weapons largely based on quantum effects of the laser. However, the question remains: how do nuclear and subnuclear technologies relate to national security and what other factors ought to be taken into account?

Military traditionalists tend to focus strongly on the weaponry aspects of technology. National security in these terms tends to be equated with ability to destroy an adversary by various means. The fact that the principal adversary also has this capability means that national security as an absolute condition, implying the complete inability of an adversary to injure U.S. society, its institutions, and its property, has disappeared. There is no foreseeable prospect that the United States can regain this condition. Accordingly, the shared possession of nuclear weapons, together with means of delivering them irresistibly against remote targets, calls for a revised definition of national security as an important task of long-range planning.

Continuation of the arms race affords no additional security. Its sole utility is to convince the adversary of U.S. determination to maintain the political and military status quo despite the cost.

The technology encompassed by subnuclear high-precision weapons is a remarkable achievement, but how it contributes to U.S. national security is not evident. Used against a major foe it invites escalation; used against a lesser foe it invites proliferation.

Thus, in dealing with the relationship of technology to national security, and in formulating a strategic concept for the use of technology to enhance the national security, it is necessary, first, to define what the national security is in 1975, and what aspects of technology, present and future, have bearing—beneficial or adverse—on that security.

It is the function of the Department of Defense to maintain the national security. The Department is accordingly concerned with such questions as: What threats are there against U.S. national security? Whence do they come? How dangerous are they? In what ways are they changing? How prepared is the United States to counteract these threats? What must be done to counteract new or changing threats?

As long as there is a credible "nuclear umbrella" to deter nuclear attack, such an attack would be an irrational folly. Policy requires that the nuclear umbrella be kept credible. But mutual reduction of nuclear weapons is as reasonable a way of doing this as is a mutual arms race, and it costs less.

The danger of escalation is offered by the continued proliferation of subnuclear precision weapons: As these spread, are deployed to NATO and other U.S. allies as in Latin America, and perhaps by the Soviet Union to satellite countries, the prospect is increased that minor conflicts will grow in intensity and geographic spread. The consequences for the national security surely need to be analyzed and not assumed to be beneficial.

NEED FOR REDEFINING NATIONAL SECURITY

At this period of the development of the world and of the United States a new epoch seems to be unfolding. It is one that appears to offer great opportunities and to threaten great dangers. The epoch demands a new definition of the national security and a new definition of the role of the Department of Defense to provide this security. The new definition of the national security requires that cognizance be taken of such elements as:

—The assured flow of imported raw materials to mass-production, low-technology industries;

—The availability of a sound railroad system, without which the U.S. steel industry would close down in 10 days;

—The maintenance of the total flow of intelligence, including data from satellite overflights, to assure stability and reliable maintenance of the deterrent;

—The desirability of encouraging a consumer-oriented technological trend in the Soviet Union to reduce the Soviet resource allocation to arms development;

—The growing technological interdependence among nations spurred by such developments as the rapidly spreading multinational corporations and the growing need for global allocations of nonrenewable resources;

—The serious shortage of capital required for maintenance of the U.S. industrial plant, as well as for investment in innovation;

—The increasing vulnerability of U.S. industry, transport, communications, and other large services systems, to all kinds of disruptions as technology becomes more complex and units grow in size to exploit economies of scale;

—The serious threat of nuclear proliferation in the absence of adequate safeguards for nuclear fuel elements and fuel reprocessing facilities; and

—The value of the highly developed U.S. agricultural technology with its great political leverage in the developing and developed world.

One lesson of Sputnik was that feats of technology serve the purposes of diplomacy and national prestige. The same lesson could have been drawn from the Berlin airlift. If the increasing of this world prestige serves the purposes of the national security, what new initiatives should be in the planning stage to this end?

National Security Planning in a Broader Context

The pervasive influence of technology transforms most issues of global policy for national security. It calls for a new conceptual frame of reference and the adjustment of public institutions to chart new courses. Foreseeable technological concepts must be assessed as to the changes they are likely to bring in the political, social, economic, and military environment. Planning is needed on a longer time scale to shape policy, devise strategy, and make technological allocations.

Already-available technologies with global impact that warrant assessment of their implications for the national security include:

—Cheap synthetic substitutes for cash crops;

—Chemicals and drugs with global social and environmental impacts;

—Massive and rapid air transportation;

—Instant communications and visual reports at great distances;

—Unlimited recording and rapid manipulation of data;

—Photographic surveys of the total area of the Earth;

—Manmade nuclear energy; and

—Global weather prediction.

Emerging issues with a substantial technological content that need to be analyzed to assist U.S. decisionmakers in the formulation of national security policy include:

—Strategy of technological exports to U.S.S.R.;

—Consequences of raising the level of military technology in the Middle East;

—Western Hemisphere stability and technology;

—Resource dependence;

—Weaponry and diminishing national security;

—Urban instability and technology;

—Wars of "national liberation" and nationalism; and

—General predictable shifts in the distribution of power, or the ability to coerce or dissuade with relatively little power.

Present institutions of the U.S. Government concerned with peacekeeping and the national security need the expertise or means of coordination to deal effectively with these emerging technological problems and opportunities. One weakness may be that both executive and legislative institutions are so enmeshed in short-term problems of reaction to external stresses that they can spare no time or energy for problems and issues of the longer-range future. Unfortunately, the reactive mode of planning consumes too much time, for it must anticipate and plan for an infinity of exigencies. By contrast, the initiative mode of planning, being more self-contained, is more economical of time while also more appropriate to a longer time frame. But the initiative mode of planning requires a means of injecting technological, economic, and social concepts of the future operationally into the decisionmaking structure.

It is suggested, therefore, that a new mode of planning, of wider scope and longer time span, needs to be adopted to deal with the complex factors that make up the national security in the modern, interdependent, technologically oriented system of nations. Among the factors to be addressed would seem to be the following:

1. A reexamination of the definition of national security in the modern technological and interdependent world, including a statement of the national goals that are implied by the new definition.
2. A retesting of traditional military assumptions regarding priority programs in the light of the new definition of national security.
3. Examination of alternative modes of planning—in particular, the reactive and initiative modes—to determine how future U.S. strategy of national security should be formulated.
4. Determination of the scope of the interface of national security with technology, and of diplomacy with technology.
5. Examination of the machinery of government available to serve the purposes of the national security as newly defined, and to achieve progress toward the national goals it implies, in order to derive preliminary specifications for institutions to plan, to decide, to authorize and fund, to implement, to coordinate, and to assess results.

Corporate Attitudes Toward Long-Range Planning

An attitude of hostility to public planning is often ascribed to leaders of private industry and corporate businesses. However, a recent article in an industry-oriented journal took a new reading of business attitudes toward long-range centralized economic planning by the Federal Government, and concluded that "not all businessmen are revolted by the idea."[544] The main thrust of the article was that those responsible for the planning should not be given authority also to implement the plans. Thus: "Plans and planners exist to help those who properly bear the responsibility for decision-making, and to help them make their decisions based on better information and on as accurate a look ahead as humans can devise." Another point made by the article was that information, properly used, helped to reduce uncertainties: "So the information needs study, to see what it may say. Hence the need for analysis, forecasting, selection of desired goals—and plans to achieve them."

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[544] George A. Weimer: "Is Central Planning Needed or Wanted?" *Iron Age*, July 14, 1975, pp. 17-19, 20, 25-26.

Lessons from the Six Cases in the Study for Short- and Long-Range Planning

The diplomatic consequences of the six cases examined in the course of the study of Science, Technology, and American Diplomacy ranged from less than optimal to nearly disastrous. In most of the cases, the evidence suggests that a more thorough and extended study of the subject might have led to a more favorable outcome.

CASE ONE: THE BARUCH PLAN

The postwar effort of the United States to achieve by diplomatic means the international control of atomic energy stands as a classic example of the need for long-range, coherent planning of the interface of science and technology with diplomacy.

One aspect of the situation was the rate and timing of postwar demobilization of U.S. troops in Europe.

Another aspect was how long the wartime alliance of the Soviet Union with the United States and Britain would persist after the war ended in Europe.

A third question of timing involved the level of Soviet competence in nuclear technology—how long an interval there would be before the U.S.S.R. possessed atomic weapons.

Against these three time frames was the problem of the multilateral negotiations toward a generally beneficial and acceptable system of international control.

In retrospect it appears that the timing of demobilization was not recognized as a factor and that the wartime alliance disintegrated much faster than had been expected, while the technical competence of the Soviets in nuclear science was underestimated by a factor of five.

The critical factor seems to have been the length of time during which the United States could maintain nuclear supremacy, as something to bargain with. The bargain needed to be concluded during the period of U.S. supremacy, with the United States in the end clearly yielding up its strategic advantage for global benefit rather than wielding force to compel acceptance of a preferential U.S. position. This requirement set the time allowance for negotiation. The time allowance to plan for the negotiation was the interval between the first disclosure to the diplomatic planners that the nuclear capability existed and the earliest point at which international negotiations could begin. Since the information about the bomb for reasons of security was withheld from the planners until August 1945, the negotiations were delayed for 2 years until a U.S. position could be developed. Moreover, the planners in the Department of State were denied essential or accurate information even during these 2 years. Meanwhile, it was being asserted by General Groves, in charge of the Manhattan Project, that the Soviet Union would be unable to duplicate the work in 20 years. And during the first 2 postwar years demobilization took place as rapidly as possible, with preference given to those longest in service and most experienced. (No effort was made to persuade troops with long service records to reenlist.)

The passage of power from President Roosevelt to President Truman in the spring of 1945 meant that a new and inexperienced leader was serving as "Chief Diplomat." Confronted with an enormous array of decisions, he could not possibly allocate adequate time to questions of planning future negotiations. Nor had he been fully briefed in the highly technical matter of nuclear weaponry before assuming the Presidency. Planning was left to the Department of State, where knowledge of the bomb had become available (as it had to the world) in August 1945, and where technical expertise was at something of a premium.

The obstacles to international agreement on a plan for nuclear control appear to have been both technical and political. In short:

> . . . during the negotiations to devise a control system, both the United States and the Soviet Union were faced with certain political and technological absolutes which were directly opposite to certain fundamental features of their respective countries. These features were integral to meeting what each country considered the requirements for maintenance of its national security. The negotiations neglected to reconcile these requirements with these dominating technological and political factors of atomic energy in order to attain adequate and acceptable international control.[446]

Factors that might have entered into the U.S. planning, had it been begun in—say—1944, could have included not only the postwar durability of the alliance, the rate of U.S. demobilization, and the level of Soviet nuclear technology, but also such important variables as the U.S. policy toward the postwar occupation and reconstruction of Europe, the achievement of high accuracy in communication between the scientific/technological and the diplomatic community, the recognition of the importance of control of both fissionable materials and radioactive byproducts, and such technology forecasts as: the possible development of intercontinental ballistic delivery vehicles, rate of commercial development of nuclear power, and the achievement of fusion (H-Bomb) explosives. Of course, fusion would have been highly conjectural and IBMs hardly less so at that time, but a decade later the first had been achieved and the second was nearing the point of practicality (based on U.S. scientific work performed in the 1920s).

Clearly, the impact of nuclear energy on diplomacy was so massive and opened up so many possibilities in the fields of diplomacy and technology that the existing planning and decisionmaking abilities of the United States—and of the Soviets as well—are scarcely to be faulted for their inability to devise an effective international accommodation. Even equipped with the retrospective wisdom of 30 years it is virtually impossible to prescribe what ought to have been done and planned for. But perhaps this very dilemma might have been considered as a factor in the decision to use the bomb against the Japanese homeland. Throughout the opening years of the nuclear age, in fact, options were lacking and decisions were reduced to "yes or no" questions, with little heed for the long-range future.

CASE TWO: COMMERCIAL NUCLEAR POWER IN EUROPE

While the United States and the Soviet Union, continued to expand their nuclear arsenals, other nations elected one by one to join the "nuclear club." France, the People's Republic of China, and then India exploded nuclear devices. At least half a dozen other nations possessed the technical and economic resources to follow suit if they chose. However, the arsenals of the United States and the U.S.S.R. exceeded any force structure within the reach of the others. Thus, at the cost of tens of billions of dollars annually, the two powerful nations have achieved what appears to be a fairly stable condition of stalemate or "mutual deterrence."

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[446] Wu, *The Baruch Plan: U.S. Diplomacy Enters the Nuclear Age*, p. 65.

It was the hope of President Eisenhower, in advancing his proposed "Atoms for Peace" initiative in 1953, to divert the energies of the Soviets and other nations, as well as of the United States, away from a nuclear arms race. The means was to be the diversion of fissionable material to the generation of nuclear power. As an initiative it had the merit of previous planning, purpose, and direction. However, by the time the plan had begun to take effect, the basis of weaponry had shifted to thermonuclear fusion weapons (the "H-Bomb"), so that the Atoms for Peace program did not significantly reduce the availability of atomic explosives for military uses.

After the Atoms for Peace initiative, long-range planning in the nuclear field proceeded sporadically, with a mixture of objectives: prevention of nuclear proliferation, exploitation of the U.S. monopoly position in enrichment of nuclear fuel elements, control of nuclear fuel, control of byproduct plutonium generated in nuclear power reactors, development of the fuel-economizing breeder reactor, protection of populations against the spread of radioactive wastes, assistance to developing countries in the acquisition of research reactors, development of a nuclear power industry in Europe, pressing research in the ultimate quest for power from nuclear fusion, and devising technological means of "keeping ahead of the Russians" in weaponry and delivery systems while also searching for a way to end or at least retard the nuclear arms race.

The sum total of all this effort seems to have been the achievement of a condition lacking in military security and progressively more hazardous as fissionable materials are placed in the custody of many additional groups. The prospect is that weaponry will not diminish as a threat, while the opportunity expands for additional nations or groups to secure enough fissionable material to make a weapon for threat or blackmail.

Throughout this period, planning seems to have lagged consistently behind the expanding risk. As the technology has spread, the U.S. national security has diminished. The persuasiveness of international control, tentatively advanced by the United States in 1947, has become rationally compelling in 1975. But the remarkable mixture of goals and objectives being pursued by the United States, and the absence of a coherent long-range planning process, appear to foreclose effective control in 1975 as in 1947. The Donnelly study presents a powerful array of questions urgently in need of attention. But current anxieties over the energy situation in late 1975 and the consequent emphasis on expanded resort to nuclear power appear to have further complicated an already difficult set of problems.

CASE THREE: THE POLITICAL LEGACY OF THE INTERNATIONAL GEOPHYSICAL YEAR

The attention of this study was centered on the nongovernmental scientific community, international in character and scope of interest. The International Geophysical Year was planned in the halls of science and largely executed as a basic scientific program, free of government direction. This aspect of the IGY was an important scientific success.

However, some elements of the IGY required government support for logistics and technical equipment. One such program was the elaborate series of studies in Antarctica. These led to the felicitous Antarctic Treaty, which might reasonably be considered as a model for extension to other geographic areas. Another was the effort by two technologically advanced countries to place in orbit an instrumented satellite.

The Soviet Union announced the intention to orbit a satellite April 16, 1955. The United States gave slight attention to the Soviet announcement but announced, July 29, 1955, its own plan to orbit a satellite. The Soviet effort succeeded October 4, 1957. After a number of well-publicized failures, the United States succeeded some months later, but the success was largely eclipsed by subsequent Soviet achievements with successively larger payloads.

It is interesting to note that the "science office" of the Department of State was inactive during the years 1955–57, and was restored only after the first Soviet sputnik achievement.

Despite the extraordinary impact of the Soviet sputnik on U.S. space activities, education, military research and development, and science advisory organizations in the Executive Office of the President, the Department of State was only modestly affected. While it is understandable that diplomats in the Department of State could regard the basic scientific aspects of the IGY as outside their scope of concern (as well as their competence), they might still have been watchful for the diplomatic implications of the program as a whole—and those of its major geographic features. For example: Might the cooperative principles developed in Antarctica be extended northward and even into the Indian Ocean? What were the implications of offshore research for a future seabed treaty and for resolving the thorny questions of seaward territorial limits? What positive implications might be found in the move toward nuclear-free zones? What would be the implications for national sovereignty of all the elements of the IGY, taken together, including the prospective overflights of numerous instrumented satellites? What durable and useful multilateral institutions and understandings outside the traditional diplomatic sphere might be initiated and nourished by the IGY for future projects to build on? How might the developing countries benefit most from the IGY? What new opportunities were there to cement a more constructive and cooperative world community of nations?

Because of the absence of an orderly mechanism for long-range diplomatic planning, closely linked to the centers of political power in the United States, these larger questions appear to have gone unexplored. And U.S. decisionmaking machinery was soon to be overloaded with the problem of reacting expensively on a short time scale to an alleged "missile gap," an apparent lag in the technology of nuclear delivery systems, the space race, the decline in U.S. technological prestige abroad, the Cuban threat, and unrest in Southeast Asia. In all these fields of action the United States lost control of the situation and sought instead to react to outside forces and developments, piecemeal and incrementally.

The conclusions of this study can be summed up as a defect in timing. What was proposed as a short-run, reactive solution to an exasperating national problem might conceivably have been successful as a larger-scale, longer-term international initiative that might have obviated the problem before it ever emerged. But the timing was wrong: a U.S. effort to help itself to wriggle out of an unfortunate excursion into "remote area conflict" proved unpersuasive. But a constructive program of regional development in a backward but resource-rich region following soon after the Geneva accords of 1954 (instead of the building of the flimsy SEATO defensive military alliance) might have won over all the nations of Southeast Asia to a partnership that would have rendered ideological conflict unnecessary, unrewarding, and unpopular.

The opportunity for massive but peaceful U.S. intervention in Southeast Asia might have extended from any time after the initiation of the Joint Study of Water Problems by ECAFE (U.N. Economic Commission for Asia and the Far East) in early 1949. It might have been initiated after France withdrew from colonial domination in Indochina at the time of the Geneva Accords in 1954. It might even have been offered as a substitute for propping up an ineffectual post-colonial government in Saigon in 1961.

As the study notes, there had been a progressive evolution of an institutional framework for regional planning and development of the Lower Mekong Basin from 1949 on: Studies were underway during the years 1952–57; three important meetings took place in 1957, leading to the consolidation of effort in a permanent "Committee for the Coordination of Investigations of the Lower Mekong." A program of data collection was instituted following the institution of a special project agreement between the United States and the so-called "Riparian States" in November 1955, and the preparation of a "Reconnaissance Report" in March 1956. Two years later, another report was made on opportunities for regional planning and development of the Lower Mekong; this report was by a U.N. team headed by General Wheeler of the U.S. Army Corps of Engineers and called for an ambitious series of main stream civil works. Three years after that, in early 1961, the Ford Foundation sent a study team to the area, and its report—in July 1962—envisioned primary reliance on the kind of practical, small-scale but far-reaching, people-to-people program characteristic of the early Tennessee Valley Authority operation in the mid-1930s.

It is not easy, even in retrospect, to say at what time a massive U.S. support for regional development of the Lower Mekong Basin might have been politically most acceptable, as well as technologically effective. But as subsequent events proved, the offer by President Johnson at Johns Hopkins University, April 7, 1965, came too late. The impetus of a nationalistic-cum-ideological conflict in Vietnam was already too strong, and U.S. initiative was replaced by a series of military reactions of diminishing effectiveness and diminishing acceptability in both Saigon and the United States.

It is possible that the U.S. difficulty in exploiting the diplomatic opportunities of regional development of the Lower Mekong Basin lay in the locus of the planning activity during the 1950s and early 1960s.

The close relationship between the National Security Council and the Department of Defense during these years meant that most of the planning was undertaken by officials with a military orientation, and it was natural for them to regard the diplomatic problems of Southeast Asia as military problems requiring a military solution. Having once embarked on this course, the United States became increasingly committed to a military solution, the ultimate failure of which cost heavily in lives, diplomatic prestige, military credibility, domestic tranquility, national resources, and dollars.

As the study points out, "It is interesting to speculate on what different course events in Southeast Asia might have followed had the Johnson offer been made at the time of the Geneva Agreement of 1954 that partitioned Vietnam." Although offering economic advantages, the regional approach was ideologically neutral and pragmatic. It had no evident political bias. The study quoted Willard Hanna to the effect that:

> In a region in which discontinuity, or outright sabotage, of internationa endeavor has heretofore prevailed, the Mekong Project may provide the long-sought-for new formula for sustained, constructive development. Here, in the past—at least in Laos and Vietnam—the familiar contemporary panacea of aid had provided no answers. What seems absolutely basic is a massive, well-integrated, areawide, peacetime program in which the riparian nations themselves can swiftly build up experience and competence in modern development and administration. Whether the Mekong Project is really appropriate or adequate to the need remains to be proved, but it is certainly the most promising scheme which has yet been proposed. The $10 billion project—to which two years ago President Johnson pledged $1 billion, once peaceful regional development became possible—would seem from almost any point of view a much better investment than $1 billion per annum in an endless Vietnam War.[546]

The study admits "it is sheer speculation" that a U.S.-encouraged Mekong Project in 1954 "might have provided a focus for peaceful economic progress, served as an educational process, and established a basis for wider cooperation" among the Riparian States, including both North and South Vietnam. However, to admit the possibility is to suggest that a more realistic and hard-headed long-range planning effort by the United States might have been able to convert a possibility into a practicality.

Moreover, the study goes on to suggest, a "slowly and deliberately encouraged regional development"—i.e., the adoption of the Mekong principles in other troubled regions of the world—"might serve U.S. foreign policy objectives in the long run." The advantages of dealing with multinational regions, for example, might take account of the following considerations:

> Emphasis is on local participation in development and planning;
>
> Subregions in greatest need and offering greatest opportunity for advancement tend to receive priority by local consent;
>
> Nationalistic preoccupations appear to be moderated;
>
> Self-help is encouraged and stimulated by being made more effective in combined actions with mutual support;
>
> National sensitivities that bilateral aid would exacerbate are less abraded by multinational arrangements;
>
> Regional cohesiveness—the tendency for people of different countries working together on a shared problem to lay aside their national differences—can result from attention to geographic regional goals rather than formal national boundaries;
>
> Burdens of foreign aid tend to be more widely distributed; and

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[546] Willard A. Hanna, "The Mekong Project," Part I, "The River and the Region," American Universities Field Staff Reports (July 1968), p. 10. However, Hanna made these observations at a time when the Johnson proposal was already a dead issue. The opportunity had been lost. The question is whether, had it been made earlier, it might have had the result Hanna hoped for it.

> The process of applying technological means to social and economic objectives can be made coherent and understandable to those who expect to enjoy the benefits.[547]

Further study and planning might turn up additional advantages in terms of the realignment of nations in regional multinational groupings. For example: What would be the consequences for U.S. security of a "world system of economically and technologically better balanced regions?" Might such a system reduce tensions among or between nations in such regions, between developing and developed nations, or even between the great superpowers? How might the People's Republic of China react to such an initiative? And finally, the study proposes the consideration of a possibility for the restructuring of the U.N. General Assembly: "Might regional voting in that body and associated U.N. agencies provide a better or more representative arrangement than the present, admittedly awkward system of one-country-one-vote?"[548]

The concluding paragraph of the study warrants repeating at this point:

> The implication of the Hanna observation, and other like writings, is that the cost-effectiveness of regional development projects is not fully measurable in economic terms alone. If an economically marginal project advances a diplomatic goal—stabilizes a region, inspires international cooperation, ameliorates tensions, provides a peaceful alternative to insurgency, offers an ideological bridge and teaches different ethnic groups how to work together—it might well be more useful than a project yielding high economic return but without these intangible benefits. There is, of course, no hard evidence that all these favorable outcomes are a likely . . . outcome of a global policy of regionalism. However, the bare possibility—as evidenced in what has been called "the Mekong Spirit"—that the concept might serve as an instrument of long range diplomacy seems worth further examination and putting to the test.[549]

The signal advantage of coupling U.S. long-range planning for diplomacy with large-scale multinational regional initiatives is that actions can be taken incrementally and developed slowly. A sense of growing hope and self-confidence can be engendered in the region. Mistakes can be seen early and corrected. And the diplomatic process of initiation can be systematically replaced by a cordial cooperative relationship among workers at the technical level in direct contact with the human beneficiaries dwelling in the region. Such constructive people-to-people contacts may indeed be the epitome of the purpose of long-range diplomatic planning.

CASE FIVE: EXPLOITING THE RESOURCES OF THE SEABED[550]

From the earliest stirrings of international law and formal diplomacy the oceans possessed the character of an international commons. Defining the territorial boundary that divided this commons from the sovereign realms of nations and devising means by which the law of nations could be extended to the international commons had prominent place on the agenda of early international law. Relative success attended these efforts until advancing technology showed the possibility that first the continental shelves and later the deep oceans themselves could be mined for oil, metals, and other valuable minerals.

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[547] Huddle, *The Mekong Project: Opportunities and Problems of Regionalism*, p. 67.
[548] *Ibid.*
[549] *Ibid.*, pp. 67–68.
[550] Doumani, *Exploiting the Resources of the Seabed*, 86 pp.

Here, if anywhere, was an opportunity to foresee the consequences of technology for international amity, and to plan long in advance to solve an international problem by international agreement.

It is not remarkable that an area amounting to some three-fifths of the surface of the Earth should be the subject of many conflicting goals and purposes, not only among the nations that border it but also for landlocked nations that still claim a share of the international commons. Among the claims at issue are freedom of the seas, the right to fish, oil deposits on continental shelves, deep ocean mineral deposits, territorial right of transit through narrows, sovereignty, disposal of radioactive wastes, control of oil spills, protection of environmental quality generally, and the right to conduct scientific research.

With so many issues at stake it is also not remarkable that the decisionmaking machinery for ocean policy is widely diffused, both internationally and for the United States.[551] Even so, it does not appear that all interested parties have access to the processes of decision. Those who ply the seas, research the weather, eat fish, or have a concern for global tidiness, all share an interest in how the seas are to be managed.

However, it was left to the tiny Republic of Malta, August 17, 1967, to propose to the United Nations a broad-gauge approach to the problem.[552] The U.S. policy on this large subject nearly 2 years later was merely that this nation was "keeping our options open until we decide where our national interests lie best and where international agreements may be reached." [553]

During the more than 8 years since the Malta proposal there seems to have been little progress toward resolving this issue which had been so long foreseen. Questions were unanswered as to whether nations possessing the technology for suboceanic exploitation should go ahead and use it, as to whether landlocked nations had any rights to the ocean floor, as to whether the poor countries of the globe ought to have some kind of preferential rights, and as to the degrees of sovereignty to assign to the near-shore, continental slope, and deep-sea parts of the ocean. Should nationalism or internationalism prevail?

One possible approach to the problem that does not seem to have received much attention thus far is to recognize that technology has changed the nature of the international commons itself. The seas were once uniform; now they are becoming of value in some areas and of little or no value in others. This technological effect may suggest the proposition that the law of the sea can no longer be generalized but must be tailored to specific parts of the oceanic whole. Each geographic subdivision of the oceans might be treated as a "region" along with the nations directly associated with that part of the ocean. These multinational regions, in consultation with each other, could shape the separate rights and obligations, laws, and jurisdictional principles to be applied within the region. Separate provision for the rights of poor nations, nations outside the region, and the United Nations as a general coordinating and planning body for all nations, might then be less of a political issue.

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[551] For international machinery see *ibid.*, pp. 46–57; for U.S. national machinery, see pp. 57–73.

[552] For the Malta proposal see *ibid*, pp. 51–52.

[553] Quoted in *ibid* at p. 80, this statement by the Under Secretary of State for Political Affairs, U. Alexis Johnson, was promptly styled by Senator Pell as a "no-policy policy."

This is, of course, only one of a variety of planning approaches that might be explored. However, the main point of this essay and an important conclusion of the study is that a great many decision points and diplomatic forums are currently involved in attempting to fit a new situation created by technology into an unaccommodating, traditional framework. It is somewhat analogous to trying to preserve the "three-mile limit" of seaward national sovereignty, originally fixed as beyond the ultimate reach of cannon shot, while aircraft, missiles, and satellites circle overhead. Planning for future changes in diplomacy cannot ignore the consequences of technology when these consequences effectively repeal the "law of nations."

CASE SIX: U.S.-SOVIET COMMERCIAL RELATIONS

The point of this study is that the efforts to increase the technological and economic relations between the two countries through expanded bilateral trade was—at least potentially—more important politically than economically. The effect of the developing U.S.-U.S.S.R. détente seems to be a gradual move to include the Soviet Union in the world economic and financial systems. A particular advantage of this move for the United States is that it could facilitate an internal Soviet trend toward satisfying consumers while reducing allocations of resources for military purposes. The presumption is that any Soviet move in this direction would be welcomed by the United States by a response in kind, thus leading to significant slackening in an arms race that has persisted for a quarter century.

The evident advantages of this development for both superpowers, in terms of both national security and human welfare, suggests that close attention be given to ways of buttressing and elaborating the arrangement. It would seem that there is no more potentially rewarding subject for attention in the long-range future. Planning in the short-term, to exploit momentary advantages (or disadvantages of the "adversary") like the Soviet short grain harvest of 1975, may be tempting. Diplomacy in both countries has tended to pursue the short-term course. But it is suggested that attention should be addressed instead to the longer-range consequences of the relationship in order to build a durable diplomatic structure beneficial to both the principal participants and to the world at large. The interests of the People's Republic of China, needless to say, must not be neglected in this context.

Lessons From the Six Issues in the Study for Short- and Long-Range Planning

All six issues studied reveal neglected opportunities for major diplomatic initiatives, and most of them also show evidence of unsatisfactory data collection, policy coordination, and policy analysis. Short-range planning is narrow in scope and impact; long-range planning appears to be negligible to nonexistent.

ISSUE ONE: THE EVOLUTION OF INTERNATIONAL TECHNOLOGY

This study finds technology to be "the most obvious avenue to national strength and international influence." It observes:

> The emerging question posed by the onrush of technology, and its effect on the relations among the countries of the world, is whether this potent factor of

> change and national power is to operate in a random way, or whether it is possible, and desirable, to devise a national strategy to guide and direct it, to stimulate innovation in some directions, and possibly to slow and inhibit innovation in others.[554]

The study then quotes a suggestion by Prof. Robert Gilpin to the effect that thought might be given ". . . to the formulation of a more explicit technological strategy designed to increase the social return of its [i.e., the United States'] immense investment in science and technology and to minimize its negative environmental effects." Moreover, "In a world where nuclear weaponry has inhibited the use of military power and where social and economic demands play an inordinate role in political life, the choice, success, or failure of a nation's technological strategy will influence in large measure its place in the international pecking order. . . ." [555]

The study suggests that there is a paradox in the fact that:

> The United States, best equipped to apply science and technology to the solution of man's global problems, and credited with the highest development of managerial skills, has been reluctant to devise and implement a positive technological strategy of its own. There would seem to be no lack of opportunities: earth resources satellites, ocean and ocean floor development, urban improvement, recovery of resources from all forms of waste, the Oak Ridge proposal for large agricultural-industrial-nuclear complexes, and many more.[556]

The possibility exists that in the absence of a positive effort at long-range planning the United States will fail to innovate:

> U.S. efforts have been concentrated in fields of high technology in a reaction against external threats; the result has been to assemble large organizations in the fields of military, space, and atomic technologies. That these fields continue to be important is not questioned. But in the design of a total national strategy of technology, the effect of their being already on the scene in great numbers is to provide pressures for the United States to keep on doing what is has been doing. Where can objective analysis and innovative policy be found that can examine alternatives or additions to the national program? [557]

The study concludes with the suggestion that multilateral cooperation in grand technological efforts may be a constructive alternative for the achievement of peace and progress, and an antidote to the invidious spread of nationalism.

ISSUE TWO: THE POLITICS OF GLOBAL HEALTH

The main point of this study was an asserted underemphasis in a field of low visibility but considerable diplomatic opportunity. However, the need for attention to global health, as a consequence of the changes wrought by technology, is growing more serious: "Today the world . . . is rapidly becoming a unit, epidemiologically speaking, and urban sprawl threatens to renew the dangers which were inherent in the unsanitary conditions of the past.[558]

One of the difficulties facing the United States in embarking upon any vigorous initiatives in the field of public health outside of U.S. boundaries is that primary emphasis of U.S. programs abroad has been bilateral while the character of global health problems is inherently multilateral. The growing health-related problems of preventing the spread of epidemics in the face of increased individual intercontinental mobility, and of dealing with problems of nutrition in the face of global maldistribution of food, the problems growing out of increased concentrations of populations in urban centers, and other critical population problems, all demand a renewed zeal in the global health field. The place of such efforts in national planning for future initiatives has not been high.

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[554] Huddle, *The Evolution of International Technology*, p. 65.
[555] *Ibid.*
[556] *Ibid.*, p. 67.
[557] *Ibid.*, p. 68.
[558] Quimby, *The Politics of Global Health*, p. 73.

In view of the practical need for action, the moral imperative that calls for action, the opportunities for improved diplomatic relations that would result from such action, and the large benefits at relatively small cost that could also accrue, it is suggested that global health might justifiably command a large place in the long-range planning of diplomatic initiatives. However, for such plans to be converted into action would require a consensus that does not yet appear to exist. Accordingly, as Dr. Freeman suggests:

> Perhaps there is need to mount an educational program so that a larger segment of the public is included in the discourse surrounding the issues of national and global public health. The status of the world's health might become a public issue; and that issue could stimulate scientific, medical, and economic debate. For in the United States, at least, debate is absolutely essential to both clarification and political action.[599]

The question that emerges out of this study is: by what route does the problem of U.S. action toward global health achieve consensus, how does it reach decisionmaking levels in the U.S. Government, and what kind of long-range planning effort might be mounted—and where—to chart the future course of constructive action that might yield the gains described above?

ISSUE THREE: BEYOND MALTHUS

Along with the problem of bringing the atom under safe international control, the problem of resolving the "food/people equation" ranks at the top of the hierarchy of long-range global problems of diplomacy. The technology is perhaps less abstruse, but the organizational and administrative complexities are probably considerably greater in bringing food and population into a humane and decent balance. As the author of this study, Dr. Allan S. Nanes, observes:

> Clearly, the two global tasks of producing enough but not too much food to feed the world's population, and providing incentives and means for the world's population to hold itself within reasonable bounds, are a tremendous challenge for modern diplomacy. The rewards of success are less impressive than the terrible consequences of failure. There is a regrettable tendency on the part of mankind to respond eagerly to rewarding opportunities, but to ignore the prospect of misfortune and delay action to avert it until convinced of its reality by its actual onset.[600]

It is possible to perceive, rationally, the adverse human consequences of overpopulation. Analysis reveals that the human consequences of a stable and balanced or declining population in a free economy can also be adverse. Population growth in some instances, the study points out, is a "powerful engine of economic growth and expansion." If the poor, underdeveloped and developing nations have encountered social and cultural obstacles to population control, the developed countries have ". . . not yet accepted the consequences of a steady state either in the numbers of their populations or in their industrial productivity."

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[599] *Ibid.*, p. 79.

[600] Nanes, *Beyond Malthus: The Food/People Equations*, p. 93.

The study identifies as one requirement for long-range diplomatic planning the establishment of a ". . . solid and scientific, factual base of information about the food/population equation, for individual nations, for the regions of the world, and worldwide." A priority item which planning itself should address is the strengthening of the base of education in all countries ". . . so that their peoples can understand the reality of the problem, and to assure that the best available technology bearing on the food/population equation is everywhere available and in the hands of people competent to use it." [561]

The complexity of long-range planning of the diplomatic aspects of the global food/population equation results from the fact that the problem ". . . cannot be considered in isolation." The separate problems of food supply and population control interact with each other and with investment, allocation of capital, job opportunities, and social well-being in both urban and rural areas. Moreover, ". . . population density affects the ability of human societies to preserve the quality of life, to make available adequate resources to sustain life, to maintain order, to govern, to insure the security of the individual from crime, to maintain the security of nations from tension or even insurrection, and to reduce the possibility of international conflicts." [562]

Another way of expressing the dilemma, as perceived in the United States, is that U.S. diplomats ". . . are faced with the job of urging technological change on the leaders of the LDCs, even though such change may have unsettling social and political consequences." As the study indicates, "It seems paradoxical for the United States to encourage the LDCs to adopt the new agricultural technology knowing that there is a high risk of social turmoil, if a principal aim of U.S. development assistance is to help bring about stability in those countries." [563]

The hard choices facing U.S. diplomacy in dealing with the food/population equation are implicit in the proposition that the United States is the foremost exporting nation of foods while the global food supply to meet an expanding global population threatens in time to become inadequate. On the other hand, quick solutions to the food/population equation in any nation under less than totalitarian control can be highly disruptive politically. The requirement for long-range and comprehensive policy planning by U.S. diplomats and policy analysts to resolve this dilemma is too obvious to need stressing.

ISSUE FOUR: U.S. SCIENTISTS ABROAD

This study of the various arrangements for funding overseas study of U.S. scientists identifies a deficiency in these programs: viz., the skimpy data on the foreign experiences, contacts, and observations of U.S. visitors abroad. Neither short-range nor long-range planning is feasible without a solid base of information about the results of past programs.

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[561] *Ibid.*, p. 94.
[562] *Ibid.*, p. 92.
[563] *Ibid.*, p. 52.

Another question involves the time of the results of overseas study. Experience with foreign research methods and subjects of investigation has undoubted value for U.S. science generally. But there is a time lapse between the designation of overseas fellowships and the accrual to this country of values from the program. This time lapse is, of course, a general characteristic of all foreign scholarship programs. The implication is that in the management of foreign exchange programs thought might be given to the needs of U.S. science for strengthening of particular fields of research in future years, or for the replacement of cohorts of aging scientists soon facing retirement.

Another question is raised by the restriction of these programs to basic research. The undoubted leadership of the United States in technology is not necessarily durable; advances of other developed countries in recent years have been notable. Many of these advances have been assisted by extensive borrowings of U.S. technology. Long-range planning by the United States might reasonably take into account the signal technological advances of other countries and identify areas in which U.S. technologists, engineers, and systems people might usefully study abroad, to meet future U.S. needs in these fields. Moreover, despite the general U.S. lead in technology, there are still many pockets of outstanding expertise abroad that could be beneficially tapped, especially in the area of low technology.

ISSUE FIVE: BRAIN DRAIN

The primary direction of the flow of people with advanced training in fields of science and technology is away from developing countries and toward developed countries. The study of Brain Drain[564] in the series thus identifies the phenomenon as a "symptom of underdevelopment." The United States is in an equivocal position on this issue: U.S. policy has long aimed at helping the developing countries to advance technologically but the United States is also a principal destination of emigrant "brains" from these same countries where they are needed in the development process.

Apart from the moral question involved, there are practical reasons of policy for resolving this issue. The need to accept the diplomatic imperative of interdependence confronts rich as well as poor nations. One pragmatic reason for U.S. concern is the fact of this Nation's dependence on mineral resources largely under control of the LDCs.

> Awareness of this problem comes at the height of the current energy crisis and suggests what may be a scenario for things to come with growing cartelization of world mineral resources and growing consciousness of increased leverage among the LDCs to be used against the advanced industrial nations. Reasons of self-interest appear to warrant a reappraisal of the Nation's posture towards the LDCs and the affirmation of a policy of interdependence.[565]

In a still broader sense, the need to take account of interdependence in the treatment of the brain drain issue may involve the goal of peace and national security. Thus:

> It would seem beyond dispute that the LDCs, long the cockpit of international tension and conflict in which the United States has not been able to stand aside uninvolved, hold the potentialities for even deeper and more dangerous involvement. War in South and Southeast Asia, recurring crises in the Middle East,

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[564] Whelan, *Brain Drain: A Study of the Persistent Issue of International Scientific Mobility*, 272 pp.
[565] *Ibid.*, p. 271.

> famine and tribal strife in Africa, are only recent illustrations of the problems that have been shaking the foundations of this volatile, troubled third world.[566]

Thus, the argument runs, social and economic development is a requisite for peace in these regions, and technological leadership is a requisite for social and economic development. To the extent that technological expertise drains away from the LDCs, the root causes of unrest are enlarged.

It is an inherent characteristic of the brain drain issue that it is long range and requires attention over a longer time span. Even in the long term, any effectively total solution to the problem is most unlikely. And in the present state of mind of the American people, when attention is directed mainly inward, vigorous attention to the international brain drain on a short-term basis is even less likely. Thus, the brain drain issue seems to belong on the agenda of long-range diplomatic policy planners. Its solution could contribute to a "world in balance, with economic and social opportunity within the grasp of all inhabitants and a sense of hope in all nations."[567]

ISSUE SIX: SCIENCE AND TECHNOLOGY IN THE DEPARTMENT OF STATE

"The thesis of this study is that the world environment of diplomacy has changed in ways that make necessary a deeper involvement of the Department of State in science and technology, a more perspicacious outlook toward technical trends for the future, and a more positive approach to the generation of innovative technical policy."[568] An essential ingredient will continue to be a strong capability for long-range policy planning insulated from the day-to-day requirements of reactive and operational planning but yet having access to decisionmaking elements in the Department and in the White House. A separate requirement is also suggested: a parallel long-range planning unit in diplomatic policy for the Congress.

The nature of the long-range planning process was described by Roger Hilsman as "analyzing the nature of the problem and making broad strategic choices for dealing with it." It involved "a groping effort at understanding the nature of the evolving world around us." It was distinguished from short-range planning, which was "working out the moves and countermoves in the midst of an ongoing situation."[569]

Knowledge and the analysis of knowledge are the essence of long-range planning. The study describes the information requirements as follows:

—An understanding of the total decisionmaking process involved;

—A formulation of relevant national goals;

—A characterization of present and probable future prevailing circumstances;

—The relation of the issue in question to all of these; and

—An elaboration of the factors that define the changing nature of the issue.

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[566] *Ibid.*, pp. 270, 271.
[567] *Ibid.*, p. 272.
[568] Huddle, *Science and Technology in the Department of State*, p. 167.
[569] *Ibid.*, p. 90.

The planning process must go further. It must maintain a continuing review of the information inputs because they are always in the process of change. But also, the planners can help to prepare the issue for decision at "high policymaking levels" by a preliminary decision process involving the following seven steps:

1. Selection of a salient issue for analysis on the basis of general criteria of importance and probable future urgency;
2. Integration of the parts of the information available bearing on the issue and the search for further relevant information;
3. Analysis of the information to identify the decisive elements;
4. Formulation of alternative possible courses of action;
5. The ordering of the information in relation to the alternatives;
6. Evaluation and comparison of alternatives as to probable costs and benefits, technical feasibility, and political acceptability; and
7. Selection of one or more preferred alternatives for further analysis and presentation to the ultimate decisionmaker.[570]

To perform this long-range planning function, the study suggests, requires a staff capability close to the Secretary of State or the White House, or both, with the following characteristics:

1. Knowledge about technological trends to obtain early knowledge of what is likely to be technically feasible and also diplomatically important.
2. Enough technical sophistication to identify aspects of an ongoing development (i.e., the diplomatic counterpart of "technology assessment") to determine what might be done to enhance beneficial diplomatic consequences or minimize adverse diplomatic consequences.
3. An early understanding of specific items of new technology (wherever developed) that has a probability of perturbing the international balance of power, destabilizing local societies, or introducing significant economic developments.
4. An appreciation of the possibilities of beneficially reacting to foreseen technological developments by diplomatic means.[571]

The history of the Policy Planning Staff in the Department of Defense has shown a number of persistent or recurrent weaknesses. When it was first created, in 1947, it was given five functions:

1. Formulating and developing, for the consideration and approval of appropriate officials of the department, long-term programs for the achievement of U.S. foreign policy objectives.
2. Anticipating problems which the department may encounter in the discharge of its missions.
3. Undertaking studies and preparing reports on broad political-military problems.
4. Examining problems and developments affecting U.S. foreign policy in order to evaluate the adequacy of current policy and making advisory recommendations on them.
5. Coordinating planning activities within the Department of State.[572]

The essence of these functions was long-range. But as time went on the efforts of the staff became more diffused and more addressed to current problems. The very competence of the staff made it an attractive unit to help the Secretary with major speeches, to help draft current policy statements, and to contribute to the "NSC paper mill." One difficulty was the sheer scope and rate of change of the subject matter: it was difficult to look very far ahead with any useful degree of precision. Difficulties were encountered in formulating goals and assumptions of foreign policy. During some periods, the staff dropped out of touch with decision levels. There was even question as to whether the concept of a long-range planning unit for diplomacy was realistic. However, the conclusion of the study is that some form of concentrated unit is essential, that it must have access to decision levels, must be insulated from current tasks, and must be able to tap all essential information sources.

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[570] *Ibid.*, p. 91.
[571] *Ibid.*, p. 92.
[572] *Ibid.*, p. 94.

The study also suggests that a comparable source of long-range planning—including both information and analysis in the diplomatic area—is needed by the Congress. The question was raised as to whether the Congress "should rely mainly on policy studies and recommendations of the executive branch, or whether these sources should be supplemented by information and analyses by competent authorities directly and exclusively responsible to the Congress." [573] The study observes "that the congressional resources for dealing today with the great and complicated issues of science, technology, and American diplomacy are widely diffused" and the "the need seems to exist for some form of arrangement to bring to a focus, and into logical unity, the diverse strands of diplomacy now being separately pursued by perhaps a dozen committees of Congress." [574]

A View of Strengthened Mechanisms of Long-Range Planning

At the invitation of the director and associate director of the Project, Prof. Edgar A. Robinson of the American University undertook an analysis and review of the study *Science and Technology in the Department of State.* Extracts from his analysis are presented in this section. His particular interest was the enhancement of institutional arrangements reflecting not only procedure but also the temper and habit of mind of long-range planning, defined as the rational management of irrational (i.e., undirected) events. He finds policy weaknesses in short-range planning, which he describes as "Attendance to immediate and imminent events with ensuing minimization of the broad-scale determinants of these events," the result being "perpetuation of crisis through serial short-range measures." He notes, also, that what passes for long-range planning is too often built upon and merely an extension of short-term techniques, with consequent absence of consistency and continuity.

> Short-range planning [Robinson suggests] may . . . properly confine itself to one country, episode, or isolated issue, whereas long-range planning may never do so. Long-range planning need invariably be supranational and suprasituational in configuration. . . . Short-range planning is concerned with constricted . . . situations; long-range planning . . . with . . . the transformation of international affairs along lines congenial to our national interest. . . .

Perhaps it is not too much of an oversimplification to say that short-range planning contrives adaptation to change while long-range planning contrives and directs change itself. As Robinson puts it:

> . . . The first goal of long-range planning should be to forge perspective, i.e., long-range criteria of well-functioning and malfunctioning interdependences. . . . Short-range planning . . . cannot deal with interdependence on other than a superficial, transient basis . . . and the outcome is nothing less than the yielding of human aspirations and needs to the mercies of historical determinism in the worst import of the phrase. The supreme purpose of long-range planning is to ensure that the ceaseless, inevitable interdependences of peoples today will be articulated in a wise, civilized and logically warranted manner.

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[573] *Ibid.*, p. 176.
[574] *Ibid.*, p. 179.

Before the Department of State can become an effective center of long-range policy planning, he writes, radical changes are necessary: the Nation's intellectual resources must be mobilized for a multidisciplinary effort to redefine foreign policy and its objectives.

As an interim measure, a truly long-range Office of *Long-Range* Foreign Policy Planning could be established. The office should be authorized to assign contract tasks to the academic community; such tasks should be deliberately long-term in focus and cross-disciplinary in scope. Instead of exposing Foreign Service generalists in-house to a modicum of technological expertise, Robinson proposes (a) to incorporate science offerings into the curricula of academic programs that prepare nascent diplomats, or perhaps (b) the seconding of Department personnel (presumably generalists) for a year of concentrated academic study in a specially designed curriculum that exposes them functionally to the physical and social sciences as tools of diplomacy. (Robinson favors the first of the two options.)

Another bridge between Government and the academic community might be the use of a wider range of qualified scholars as informal consultants and reviewers of "think pieces" prepared within the bureaucracy.

Another possibility might be for the Department of State to experiment with a "Rand-style" affiliate entirely its own. As Robinson puts it:

> This group would ordinarily report to the Policy Planning Staff, nourishing it with proposals, data, and ideas as requested, thereby deepening the pressure on the Staff itself to resist disruptive clamors for operational manpower. As I construe it, the optimum would be to entrust a portion of the tasks "farmed out" to professionals in the academic sphere and another portion to the newly created "Long-Range Foreign Policy Planning Corporation," initially allotting the two some identical assignments.

Robinson suggests that one valuable direction of inquiry might be to investigate "what selected foreign ministries do by way of encouraging 'broad-gauge thinking' in the devisal of foreign policies." ("Are they ahead of us, or behind us? In either event, what are the implications for the United States? What germane structural arrangements exist, or are noticeably absent, overseas?") Is it possible that collaborative studies might be launched with other States into these matters, as for example through the Organization of Economic Cooperation and Development?

Another need is for "Long-Term Forecasting." As he says, "To predict, to project into the future with a decent confidence is, coincidentally, to be able to act on the international stage with more predictability." Accordingly, he proposes that:

> With the Office of Long-Range Foreign Policy Planning, there might be a unit devoted exclusively to Long-Term Forecasting. It would not engage in any planning as such. . . . Its functions would be divided between research and the projection and interpretation of trends in international affairs and identification of their causes.

As Robinson points out, the pace of technological change in the world is so swift that there is a temptation to be defeatist about the ability to look forward. However, a policy of drift and retrospection, in the last analysis, needs to assume that all technological change is beneficial and that technology cann t be subject to intelligent social direction.

Thus he concludes: "the public interest is what is at stake, rather than the unrestrained prowess of technology." And to relate technology to the public interest in the diplomatic sphere "mandates a long time span of analysis":

> The *indirect* consequences of progressions in science and technology absolutely do not lend themselves to valid forecasts by way of a cramped temporal framework. I concede [Robinson continues] the dangers and difficulties of employing more-expansive time-scales and the readier manageability of data when a time-scale is slender in scope. I cannot, however, concede that a constricted time-scale can comprehend much more than the *direct* consequences of science and technology—certainly not their still-more-portentous long-range import. Short-term policy analysis too often ends up in vassalage to the regnant hour, artificially elongated beyond a reasonable sway. (His emphasis.)

Robinson criticizes the present study for relying too much on what has been popularly termed "The Establishment." He proposes that "traditional" sources of policy studies be augmented by a "rotating group of short-tenure professionals recruited from the 'non-Washington' world," drawn principally "from the intellectually supple, younger elements" who would provide "provocative argumentation as well as fresh approaches and perspectives, and would return to the private sector before they became either stale or institutionalized." (The Committee on International Relations, he adds, might with benefit entertain the idea of incorporating such intellectual gadflies into its own staff.)

An interesting challenge to the Department of State is the analyst's proposal that it "assess and maintain unremitting scrutiny of the activities of multinational corporations from the standpoint of the diplomatic ramifications of their activities." Such a focused planning activity, apart from its utility in diplomacy, would have educational value in opening up the world of international technology transfer and its subject matter to Foreign Service generalists. (While in Professor Robinson's view the multinational corporation is now more a threat than a benefit to ordered intercourse among nations, it is also possible that cooperative relationships and diplomatic guidance might cast this expanding institution in a more constructive and beneficial role.)

Another important subject for planning, in Robinson's view, is the "meaning and scope of the term National Security." A valuable service would be the provision by statute of a definition of the criteria of national security to "thwart its flaunting for devious and improper purposes."

With respect to the congressional role in long-range foreign policy planning, Professor Robinson endorses strongly the creation of a separate entity for this purpose. And he further suggests that such a staff institution for the Congress:

> . . . Should help to redress the balance between the Congress and the Executive, goad the Department of State to a higher level of performance by inspiring it to strengthen its own policy-preparing mechanisms, and enable Members of the Congress to inform and educate their constituents more confidently than can be expected today. On the personnel side, it seems desirable that staff affiliation be sufficiently enticing so that, while there is generous hospitality to newcomers from time to time, there is constancy at the core.

The Murphy Commission's Design for Foreign Policy Planning

Specifications for reform in "planning for foreign policy" were presented to the President and Congress in a report, June 27, 1975, by the Commission on the Organization of the Government for the

Conduct of Foreign Policy (the "Murphy Commission," named after its chairman, Robert D. Murphy). An eight-page statement[575] describes the function and suggests what the planning product and organizational structure for foreign policy planning should be.

The context was briefly covered:

> In a rapidly changing, interdependent world, foreign policy to be effective must achieve coherence over time. Shaping an international order or managing interdependence will be possible only by actions which reinforce each other over an extended period. While it remains adaptable to changing conditions, policy must therefore serve consciously developed long-term goals and priorities.

Although the conduct of foreign policy ought to be long range, said the report, diplomatic officials tended to neglect long-term consequences "under the press of the demands of the moment." Greater attention needed to be given to planning as a "separate function." Diplomacy should consist of: (1) the identification of future trends offering problems and opportunities, (2) a definition of long-term goals and priorities, (3) the relating of day-to-day decisions to longer-term priorities, and (4) the modification of strategies and courses to meet new conditions or to correct missteps. Four planning functions were required (summarized):

> 1. Coherent definitions of long-term purposes and priorities [and assumptions?] developed from a broad perspective of national interest and called "strategic concepts." What was needed was a periodic "State of the World Report."
> 2. Achievement of coherence and compatibility of day-to-day actions with long-range strategy. Reconciling present diplomatic relationships with long-range courses is difficult but necessary. Also, "the President and the Secretary of State, if they are to affect the future, need planners, not encumbered with existing arrangements, to look at the future impact of current decisions, constantly to search for new directions and to suggest initiatives."
> 3. To counteract the tendencies of operational officials to become advocates of their ongoing policies, the planners "must take an adversary role, testing the the rationale of decisions, questioning assumptions, checking data, asking whether full account has been taken of longer-term objectives."
> 4. Since policies may fail, correctives will be necessary; planners must "observe the actual effects of policy, and reevaluate assumptions accordingly."

The report called attention to two considerations in planning: one was the necessity for close relationship with the intelligence function, especially in estimating "probable effects of alternative courses of action"; and the other was the dilemma of the relationship of planning to operations. This dilemma was not resolved in the report.[576]

SUGGESTED PLANNING PRODUCTS

The products of planning, the Commission noted, take many forms: oral assessments of alternative analyses and courses, memoranda, participation in interagency exercises, advocacy and forecasting studies, and proposals for initiatives. The two formal products should be a "strategic concept for foreign policy" and a "Global Systems Critical List." The former should be a comprehensive statement of U.S. diplomatic and economic purposes, their structure, and the boundaries of U.S. responsibility in the world. It should be prepared under leadership of the Secretary of State, drawing upon the National Security Council, and on the expertise of the many departments involved.

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[575] Report of the Commission on the Organization of the Government for the Conduct of Foreign Policy (Murphy Commission), Washington, U.S. Govt. Print. Off., June 1975: Chapter 10, "Planning for Foreign Policy," pp. 143–150. For a brief note on the Commission see Huddle, *Science and Technology in the Department of State*, p. 140.

[576] Thus, on p. 143 the report notes that those associated with current operations tend to resist the need for adaptation to long-range policy. But on p. 145, it asserts that to be "influential," planners need to be "close to operations, at some cost to the quality and independence of their planning" because full insulation from current business means that the planners have "little impact." It concludes that "A blend is needed." However, as a practical matter, the demands of current operations will always take precedence over long-range planning whenever the two are merged in a single staff unit.

The "State of the World Report" was seen as a revival of a practice initiated by President Nixon during his first term. However, the second proposal, that of a "Global Systems Critical List," was something of an innovation in the report as to both its content and proposed implementation. This list would be an "authoritative inventory" of "possible catastrophic effects and the major new opportunities arising out of the uses of the world's physical resources and environment, and from new developments in science and technology." Preparation of the list should be objective, expertly done, and politically insulated. It should therefore be assigned by statute and Presidential directive to a "prestigious and independent organization of scientists" such as the National Academy of Sciences. The list should present problems and opportunities ranked in importance in relation to such specific areas as oceans, atmospheric pollution, food, and the like. A role was suggested for the Congress in exploring the further detailed implications of items on the list. A role was also suggested for the President's "principal science adviser" in preparing the list, in drafting an "impact statement," and in following up on what the administration did about items listed.

ORGANIZATION FOR PLANNING

The Murphy Commission dealt briefly with delineation of the organizational scheme necessary to implement its recommendations for foreign policy planning. No reference was made to the legislative branch in this discussion. In addition to the suggestion already cited for assignment to the National Academy of Sciences of responsibility for a Global Systems Critical List, the report proposed creation of a new Council of International Planning (CIP), strengthening of the Policy Planning Staff in the Department of State, and creation of an Advisory Committee of outside experts to advise the Department.

The CIP, patterned after the Council of Economic Advisers, would serve the President directly and "in a manner of his choosing in the planning for foreign policy." It would give special attention to the Global Systems Critical List and call for research support from Government agencies and the academic community. The Commission again sought here to deal with the dilemma of operational versus long-range planning: "We would hope that the CIP would be close enough to operations to give its work a necessary relevance, but sufficiently detached to give it freedom to walk less traveled roads."

The Policy Planning Staff, the Commission suggested, would ultimately be what each Secretary of State made of it. "No planning staff, however well organized and adroitly managed, will be effective if the Secretary himself does not believe in the planning function." With respect to the long-range versus operational planning dilemma facing the Policy Planning Staff, the report again retreated: ". . . Proposals to insulate planners from operations so that they do not become mired in day-to-day concerns are partially misguided. Unless a planning organization is useful to the Secretary and the Department in helping them cope with current situations, it is likely to atrophy or decline into irrelevance." While the Commission attached little significance to the way in which the Policy Planning Staff was organized, it offered (in italics) three suggestions:

> A single, highly competent officer, personally selected by the Secretary, should be given full time responsibility for the work on the "State of the World Report."
>
> Regular members of the Policy Planning Staff would normally be expected to involve themselves at one time or another in each of the planning functions—anticipation, challenge, reevaluation, and the formulation of strategic concepts.
>
> The Director of the Policy Planning Staff should have one deputy to lead the work of the staff in fulfilling the role of anticipation and initiatives, and another deputy responsible principally for the challenge and reevaluation functions.[577]

In considering means of tapping outside expertise the Commission considered and abandoned the idea of creating by contract a Rand type of analytical advisory service responsible to the Policy Planning Staff. Instead it favored a "less restrictive" arrangement that would "seek more widely, and more selectively, expert assistance whenever it can be found . . . ." To assist in tapping the academic community at large, the Commission recommended that:

> An Advisory Committee be created by the State Department, consisting of outside scholars and experts who can assist the Planning Staff [to] keep abreast of new developments of substantive and methodological kinds. An officer of the Policy Planning Staff should be charged with matching the Staff's needs with outside researchers best qualified to meet them, and with being its link to the Advisory Committee and the external research community.[578]

The Commission's discussion of policy planning concluded with suggestions for strengthening the Bureau of Intelligence and Research (INR) and for a fuller exploitation of "new methodologies and analytic techniques." With respect to INR, the Commission stressed the functional importance for planning of the "external research arm" of INR. It said:

> The closest collaboration between the planning office and the external research arm of the Bureau of Intelligence and Research (INR) is of course imperative. In order for this external participation in planning to be effective, additional resources will be needed, and better management of the sometimes difficult relationship between government and outside researchers and consultants must occur. The responsible officer should identify needed policy research in time to be relevant to policy concerns. He must establish necessary priorities among them. Within the State Department, individual planners or groups of planners working on specific projects should be allocated funds to acquire the services of consultants. The relationship between planners and outside experts should not necessarily be a comfortable one; a major purpose of the relationship between the two groups would be to compel planners periodically to reevaluate their own guiding assumptions.[579]

On the subject of new methodologies, the report cited "computerized information processing and analysis, more sophisticated decision aids, gaming and simulations, and a variety of forecasting techniques for policy analysis." In the testing and use of such approaches, it would be necessary to maintain closer contact with the academic community.

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[577] Murphy Commission report, p. 148.

[578] *Op cit.*, 149.

[579] *Ibid.*

Some Further Comments on Executive Branch Planning

Throughout the series on Science, Technology, and American Diplomacy the need has been evident for deeper and more sustained study of the larger canvas of foreign policy: the global context, U.S. goals and priorities, future projections, the testing of assumptions, the planning of constructive initiatives, and achievement of consistency in present-day operations with well-charted courses for the future. These appear to have been the concerns also of the Murphy Commission.

However, it is possible that in its effort to be realistic in handling the dilemma of short- versus long-range planning, the Commission did not meet the issue head on. It ultimately opted for a Policy Planning Staff that combined the two time scales. Another alternative that warrants consideration is that proposed by Professor Robinson: the creation of a dual Planning Staff, one short-term unit and a separate (and well-insulated!) long-term unit. And an early item of business of such a staff would be the study of the significance of time spans in policy planning. How far into the future should long-range planners try to look? How short a time frame is it safe for operational planners to be constricted by? How do the broader analyses of long-range planning become useful guidance for operational personnel, short-term planners, and the decisionmakers in the White House, the Secretary of State and his immediate associates, Members of the Cabinet, and the National Security Council? Also, how might the penetrating analyses of the Policy Planning Staff—both halves of it, as Professor Robinson has suggested—become useful guidance for the Congress? And finally, what in-house staff organization does the Congress possess against which to play the findings of the Policy Planning Staff of the Department of State?

The Murphy Commission's proposal that a Global Systems Critical List be prepared by the National Academy of Sciences is a creative addition to the literature of foreign policy planning. However, difficulties with its implementation can be foreseen. At least a part of the information input required for such a list would need to be highly classified data from intelligence sources. The assembling of the list would need to be an iterative process, with items tabulated, organized into groups, and then reexamined as to priorities of attention based on futher information. If the seabed should be an item, for example, its scope would need to be determined, and then experts would be recruited for the NAS panel to cover the requisite scope, drawing on intelligence as well as unclassified sources for further information. The required succession of security clearances would virtually ensure that the list was obsolete before it has been completed and analyzed for priorities. Indeed, it would be interesting to consider how such an arrangement could be accommodated within the Academy framework and various requirements for "freedom of information" imposed on consultative groups to the Federal Government.

An alternative possibility was offered in a bill reported from the House Committee on Science and Technology, October 29, 1975.[580]

This bill was unanimously reported by the committee with administration support.[581] A clean bill was introduced October 20 as H.R.

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[580] The National Science and Technology Policy and Organization Act of 1975, Report No. 94-595, 94th Cong., 1st sess. Initial sponsors were Olin E. Teague and Charles A. Mosher, Chairman and Ranking Minority Member, respectively, of the Science and Technology Committee.

[581] By letter of October 8, President Ford declared the bill "acceptable and I will support it if your committee and the full House approve it essentially as it now stands."

10230; as amended by the Senate to incorporate the substance of S. 32, it was signed by the President on May 11, 1976, and became Public Law 94–282, the National Science and Technology Policy, Organization, and Priorities Act of 1976.[582] The new act contains a finding—

> Sec. 101(a)(2) the many large and complex scientific and technological factors which increasingly influence the course of national and international events require appropriate provision, involving long-range, inclusive planning as well as more immediate program development, to incorporate scientific and technological knowledge in the national decisionmaking process.

Included among the policies enunciated in the act are "promoting foreign policy objectives" and a requirement for the Federal Government to "maintain central policy planning elements in the executive branch . . . " to identify . . . "problems and objectives" . . . and to anticipate . . . "future concerns to which science and technology can contribute. . . . " To execute these policies, the bill would provide for the establishment in the Executive Office of the President of an Office of Science and Technology Policy, headed by a Director and "not more than four Associate Directors." The Director, presumably in consultation with his assistants, would "advise the President of scientific and technological considerations involved in areas of national concern including [among other matters] foreign relations. . . . " He would also "assess and advise on policies for international cooperation in science and technology which will advance the national and international objectives of the United States." And he would "identify and assess emerging and future areas in which science and technology can be used effectively in addressing national and international problems." In the performance of these functions the Director would " . . . develop appropriate working relationships with the National Security Council . . . ."

There would, of course, be no reason for the Director of the new office to neglect the advice of both the National Academy of Sciences and the National Academy of Engineering, along with their supporting instrumentality, the National Research Council.

With respect to the Murphy Commission proposal for an Advisory Committee to tap academic expertise in the foreign policy area, it is possible that a twofold mechanism of external advice might be entertained. Indeed, Professor Robinson has suggested just such an arrangement. In view of the fact that the three military departments and the Office of the Secretary of Defense all have dual advisory mechanisms of this type, it does not seem unreasonable to provide the Department of State with an equivalent system. Some advisory studies are more appropriate for a relatively permanent Rand-type organization, with personnel fully cleared for the handling of classified information, and closely responsive to declared needs of the Policy Planning Staff and the Secretary of State. Other studies of a broader, more exploratory nature might be more suited to an academic institution or team under the general guidance of such an advisory committee as the Murphy Commission has recommended. The roles of the Policy Planning Staff, the Bureau of Intelligence and Research, and the Bureau of Oceans and International Environmental and Scientific Affairs, in relation to both sources of policy studies would be important.

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[582] The bill was signed at a Rose Garden ceremony attended by leading scientists at which anthropologist and A.A.A.S. Retiring President Margaret Mead "commented that the action was Mr. Ford's peace offering to the scientific community, which has missed its entree into the Oval Office through a resident science adviser" since the office was abolished by President Nixon 3 years ago. (*Washington Post*, May 12, 1976.)

Precisely how the Council of International Planning proposed by the Murphy Commission would serve in relation to these various other planning organizations is not entirely clear. The Commission's idea that it would address "a few carefully selected problems" on the instruction of the President has a ring of the short-term planning approach. The President is rarely free to think about problems and opportunities a decade hence. The Council of Economic Advisers (on which the CIP would be patterned) is limited by statute to short-range problems. It is not clear what would be gained by adding another mechanism for operational planning of diplomacy to those already available, if that is indeed the intention.

Some Further Thoughts on Foreign Policy Planning in the Legislative Branch

The Murphy Commission in its section on planning addressed mechanisms for the executive branch almost exclusively. Historically the tendency has persisted to regard the President and the executive branch as the primary locus of foreign policy and the custodian of information on which the policy is based. As long as the President and Congress are of the same political party, or as long as there is a tacit agreement between the President and Congress that "politics stops at the water's edge," congressional acquiescence in Presidential leadership and direction of foreign policy may be no great issue. However, when significant policy differences exist between the two branches, a separate congressional role in the process of planning of foreign policy may be demanded by the Legislature. There are a number of reasons why such a planning instrument of its own might be desirable and useful. For example, it could be made responsible for such services as the following:

The testing and evaluation of the President's structure of foreign policy decisions;

Determination of the alternative consequences of supporting, or challenging, Presidential policy initiatives;

Identification of important problems and opportunities that the President may have neglected for reasons of policy or otherwise that still warrant legislative consideration;

Relating individual legislative actions to the long-range directions of national policy for foreign relations;

Evaluation of policy options offered by the executive branch that require legislation for their implementation;

Evaluation of ongoing programs and operations of the diplomatic apparatus as to consistency with broader and long-range national goals and priorities shared by the President and Congress;

Independent determination of the reasons for failures and shortcomings of policy decisionmaking by the executive branch;

Assurance that the policy planning processes of the executive branch maintains a high quality of product and performance; and

Achievement of coherence in the sometimes fragmented items being separately offered as legislative proposals.

It is also possible that the same dilemma would exist for the Congress as was encountered by the Murphy Commission in prescribing a planning mechanism for the executive branch; i.e., congressional as well as executive needs exist for both a short- and a long-range policy planning service. If a single planning unit should be created for the Congress it is probable that its time and attention would be preempted to satisfy requests for advisory services relating to current problems. On the other hand, if it were totally insulated from day-to-day problems, it might—as the Murphy Commission report suggests—drift into atrophy and irrelevance. Accordingly, it may be that a two-part service, separately structured but functionally related, might be as appropriate for the Congress as for the Department of State. The factor of timing in the formulation of foreign policy is no less important to the legislative than to the executive branch. Also, coherence in planning and coherence between planning and operations, both essential in the field of foreign policy, are apt considerations for legislative oversight.

Conclusions and Observations

In a steadily constricting world facing grim future decisions of national equity, power competition, resource allocation, rational or irrational uses of technology, and rational or irrational governance in national states with the capability or potential for mass destruction, the need is evident for the highest possible quality of thought for the future.

In the comic strip "Beetle Bailey," one of the characters, learning of the deterrent posture of mutual destruction, asks: "How did we get into this mess?" It is now important to ask: "How do we get out of this mess?"

The alternatives are to seek a rational way out, or to hope that the random and irrational forces at play in the political interactions of nations in international anarchy will somehow avoid disaster.

The resources of the Department of Defense to inflict ultimate disaster upon an adversary have not been stinted. However, the Department of State has been less well endowed. The reasons for this disparity are complex, but reduce to the proposition that force is concrete, measurable, and definite, while diplomacy is abstract, hard to measure, and indefinite. So too are the consequences of public investment as between force and diplomacy. The disparity also relates to centuries-old differences in habits of thought about the conduct of warfare on the one hand and diplomacy on the other. It has always been considered necessary to approach warfare systematically in organizing, equipping, and drilling forces and in commanding them in battle. Diplomacy, however, has tended to be approached on an intuitive, seat-of-the-pants basis (often the seat of only one man's pants). In short, the need for long-range planning has been acknowledged in the military sphere, but disavowed—or at least neglected—in the diplomatic.

Proof of the value of long-range policy planning is hard to document, but only by sound policy planning would it be possible to establish the true ultimate value of diplomacy. The justification for a strengthened planning capability for U.S. foreign policy is that it affords the best hope that the great destructive power in the Department of Defense and in its foreign counterpart will increasingly become irrelevant and unnecessary.

XI. Some Concluding Observations

This final statement attempts to distill the main problems disclosed by the entire study and to offer some possible legislative options to improve the national capacity to overcome these problems.

One fact is evident. The uses of technology in the service of diplomacy need to be made more rational, coherent, constructive, effective, and sustained. Somehow the talents of diplomacy and the expertise of technology need to be brought together to work in concert.

Technology—the systematic employment of rational and empirical methods to achieve human purposes—has been shown to be a principal element in the interactions among nations. It has given military forces instruments of total destructive power. It has offered human societies the means to overcome the Malthusian dilemma of population pressure on food, resources, and land. It has generated serious, even dangerous, degradation of the earthly environment of land, water, and atmosphere. It has intensified age-old problems of diplomacy like ocean sovereignty, and created new ones like space satellite communications and surveillance. It has enabled the world's peoples to change surroundings, life styles, habits of thought, and physical capacities more in the past century than in the previous 2 million years or so that mankind has lived on the earth. Technology contributes a large part of the substance of modern diplomacy. The question is thus posed: what adjustments in organization, in institutions, in plans and doctrine, and in operational procedures, are now needed in response to this massive change steadily being wrought by technology in the substance of diplomacy?

The Threat and Promise of Technology for the Future of Mankind

The National Aeronautics and Space Administration has underway a multimillion-dollar search for evidences of intelligent life in outer space. Among other things, this program seeks—according to one participant—to discover whether intelligent beings more advanced than those on Planet Earth had found it possible to organize and conduct themselves in such a way as to survive technological progress for many millenia. The value of this knowledge would be incalculable. Can a planet of heterogeneous intelligent beings capable of self-destruction refrain indefinitely from using this power? As a practical matter can ways be found to resolve disputes, reduce intransigence over values in conflict, distribute physical resources satisfactorily, and evolve a system of global institutions based on the same aspirations that are found in the Preamble to the U.S. Constitution? Is it possible for the nations of the world to recognize the interaction of interdependence and national self-interest—and to comprehend that their shared aims and goals are more important than the issues that divide them?

Already, on Planet Earth, human technology has reached the point at which it is capable of destroying human civilization. One obvious goal of diplomacy is balanced quantitative reduction of this capability.

Another is the reduction of motivations that tempt nations to employ the technology of destruction. The central goal of U.S. diplomacy is to achieve not merely national but global security. On this point alone, diplomacy's relation to technology has unprecedented significance for the future. In the individual nation-state, men make laws to protect themselves from each other; but in the anarchic world of states without law, only fear, perceived self-interest, and sustained diplomatic efforts stand in the way of destruction by technological means.

INTERACTIONS OF TECHNOLOGY WITH DIPLOMACY

Technology is linked to diplomacy in many ways. If technology presents mankind with the greatest threat of all time, it also presents the greatest opportunities for mitigating sources of conflict rooted in differences of access to and effective use of the basic resources needed for human survival. Second, technological accomplishment can contribute to diplomatic leadership and respect in the community of nations. Third, the flow of technology from nation to nation is not only a major subject of trade but a determinant of future economic well-being, and as such should be a prime subject for diplomatic analysis and policymaking to eliminate a prime source of international conflict. Fourth, technology supported by competent scientific underpinning secures domestic economic opportunity and appropriate growth, making possible a busy and productive society necessary for the backing of peaceful diplomatic initiatives abroad.

Neither the evolution nor the transfer of technology is an unmitigated good. The achievement of nuclear weapons may have put an end to general war among major nations. But the threat of mutual destruction persists, as does war of more limited magnitude. On a lesser scale, many of the technologies mankind has developed yield both goods and bads; and as has been shown, these technologies and their consequences diffuse rapidly across boundaries and oceans. Diplomacy has thus the double task of maximizing beneficial consequences and minimizing undesirable consequences of technology in international application.

In short, technology, its translation into economic consequences, and its management for purposes of global amity present the primary variable as well as a principal substance of present and future diplomacy. If the interplay between technology and diplomacy is not managed rationally, it will be conducted irrationally. The irrational conduct of international-technological relations in an age of totally destructive military weapons presents the extreme of danger. The rational application of present and prospective technology for the sustained achievement of generally improved health and living standards of the world's people presents the extreme of opportunity. The challenge to American diplomacy is to design institutions and methods to formulate and implement rational policies to reduce the danger and exploit the opportunity.

THREE GUIDING PRINCIPLES

A useful political principle to guide the course of American diplomacy in this quest is one that has guided the American political system for much of its 200-year history. The American political tradition is based on the principle that adversary parties compete for power while recognizing the fundamental constraint that the values they share are more important than the issues that divide them. The animosity of conflict is mediated by the goodwill engendered by cooperation. With one tragic exception, there is thus within the United States a history of compromise and avoidance of intransigence.

This practical philosophical principle can—it is to be hoped—be coupled with two other outstanding American qualities in the pursuit of the overriding diplomatic goal. These two qualities, technological skill and skill in administrative management, have produced in this country a reasonably balanced national economy with diminishing extremes of income, a generally superior level of education, and—probably most important of all—a widely shared conviction that the shortcomings of the American system can be corrected by a combination of political process, social organization, and individual effort.

One goal of American diplomacy, it would seem, is to resume the export of this underlying optimism of the U.S. body politic. To lend it substance, the machinery of U.S. diplomacy can—and, given Presidential and congressional leadership with understanding of both the compelling need and the dramatic opportunities, *will*—call upon the American skills in technology and administrative management for systems of social service and economic opportunity to be the basis of diplomatic initiatives abroad.

If, as Ambassador Moynihan has said, the world is in a "hell of a mess," the challenge is the greater and the more imminent. Many recent observers of the American political system have described it as motivated chiefly by crises. Things tend to get worse before they get better. If so, the opportunity for betterment must be near at hand.

A Framework for a Strengthened U.S. Diplomatic System

American diplomacy, both in general and with particular reference to its uses and management of technology for purposes of foreign policy, has the opportunity to correct a number of operational weaknesses. These asserted weaknesses may be summed up as follows: reactive diffusion of effort, neglect of priority elements, emphasis on short-range reactions to crises, isolation from the public and its political representatives, excessive attention to parochial interests, inappropriately structured policy formation, limited capacity for coordinating overseas activities of mission agencies, and uncertain mechanisms for playing a constructive and influential role in multinational institutions. Even if overstated, these asserted defects reflect a consensus of criticism from both outside and within the diplomatic apparatus.

A review of the 12 studies in the present series suggests that three organizing elements now lacking are required for the task of cementing world peace and the turning of swords into plowshares. These three items are a sense of national purpose in consonance with the thrust of historical forces, a sense of the sweep of historical change, and an appreciation of the *what*, the *why* and the *how* of technological diplomacy. From these three basics are derived many supporting requirements. For example:

A SENSE OF NATIONAL PURPOSE

National purpose is an expression of national leadership. The qualities of leadership include the ability to listen, to evaluate, to decide, and to persuade and educate. Leadership means choosing goals and mobilizing social energies for their achievement. It is a moral or ethical function, because both the goals and the means of their implementation must be compatible with national ethical standards if they are to be accepted. They must be coherent goals to be both understood and manageable. The sense of national purpose will be incomplete if it lacks either the unifying force of the Executive leadership or the mediating assessment and approval of concerted legislative leadership. Leadership is needed also in the supporting institutions of government, in the coordinating bodies that relate the programs of these institutions, and in the groups and institutions of academicians, technical people, and others who influence the public. The goals that express the national purpose must be technically feasible and practicable. They must be politically acceptable. And they must awaken the sustained enthusiasm and willing support of all those whose shared efforts must be enlisted in their achievement.

A SENSE OF THE SWEEP OF HISTORICAL CHANGE

Eras of change call for a capacity for orchestrated national adaptation—the adjustment to an evolving external world. Courses of action that originate in the centers of power tend to be formed in reaction to the perceptions of the immediate world of affairs. The achievement of coherent and sustained foreign policy requires the input from many sources less pressed by events and forces of the moment. As national goals take form, mechanisms of planning that relate them to the real world must relate them also to the relevant historical past, the evident trends of the present, and the probable courses of the future. A sense of time and a sense of timing are necessary for the ordering of goals and priorities, and for the allocation of effort to the design of program options and institutional instruments for their execution. A sense of the sweep of historical change must embrace the functions of negotiation, relations among states, and sources of tension and disaffection across national boundaries. It must also comprehend the changes that occur in the sources and expression of national power, of which technology is a foremost element. Timing and change call for a capacity for orchestrated national adaptation—the adjustment to an evolving external world.

TOOLS OF TECHNOLOGICAL DIPLOMACY

The resources of technological diplomacy are a combination of institutions (and their processes) and technologies. The institutions of science provide a cultural base from which to establish bridges to the rest of the world; they are a training ground for technologists; a source of new technologies, and a means to an understanding of the workings of new technologies. Diplomacy needs to find ways to exploit constructively the bridging function of world science. The institutions of technology provide an innovative base for domestic industry and foreign trade; they generate the concepts, systems, and hardware that are the substance of technology transfer. The innovations of technology themselves, as well as the institutions that produce and manage them, generate many, perhaps most, of the problems and opportunities of present-day diplomacy. Out of the riches of technology should be drawn diplomatic initiatives that best and most durably advance the Nation's foreign policy goals.

Institutional tools.—In the process of technological-diplomatic policy, many nongovernmental institutions need to be called on for support and brought into harmony: the colleges and universities, the not-for-profit and interdisciplinary research organizations, scientific and technical societies, the multinational corporations, labor unions, private industry and its associations, and foreign policy study groups. Many policies need the joint participation of other governments, working through bilateral, regional, and other multilateral organizations as well as international nongovernmental organizations of scientists, engineers, and others.

The numerous governmental institutions whose participation in technological diplomacy is essential fall into three classes: (1) those concerned with policymaking, like the Executive Office of the President, the Secretary of State and his immediate associates, certain congressional committees, military policymakers, and the principal planning elements in the Department of Defense, NASA and ERDA; (2) those concerned with coordinating the exercise of technological diplomacy, like OES and IO in the Department of State, the National Science Foundation, the Department of the Treasury, and—again—the Executive Office of the President; and (3) those concerned with actual operations, which include virtually all mission-oriented departments and agencies of the Government.

These are the institutional resources (and doubtless there are others) that need somehow to be mobilized in a concerted effort to apply the technological and management skills of the United States in the devising and execution of an effective technological diplomacy for the future.

The technological tools of diplomacy.—The range of technological resources applicable in future U.S. diplomacy is virtually limitless. The technologies of agriculture, lumbering, mining, and food from the oceans are all basic needs of developing countries and still vital as a developing economy reaches higher levels. Manufacturing technology extends over a vast range from cottage industry and hand labor to computer-directed machine tools and mass production. The design of products is comparable in scope. Basic to a nation's technological well-being, and thus of consequence for diplomacy, is the supporting infrastructure; it includes education at all levels, health services and medical care, the collection and management of social data, scientific research, libraries and information centers, and systems for the distribution of goods and services. Also essential to the infrastructure are technological systems for transportation, communications, and energy. Diplomacy is now involved in the transfer among nations of technology related to all of these.

More recently, growing mainly out of military developments, aerospace, electronics, and atomic energy, the uses of "high technology" in diplomacy have become salient. Synchronous satellites for communications, orbiting satellites for surveys of weather and resources, computers for rapid processing of all kinds of social data and technical information, nuclear powerplants, and processing plants for nuclear fuel are all subjects of the diplomacy of "high technology."

More than the technology of military hardware, all these technological systems today relate to the goals of the world's nations. Indeed, their main significance for the diplomacy of the future is in the hope they afford of diverting the efforts of the world's nations away from the development and use of military hardware.

Strengthening Executive Branch Management of Technological Diplomacy

In general terms, the institutions of U.S. diplomacy need to be strengthened in three ways: First, it is necessary to improve their knowledge of the strengths and weaknesses of technology as a source of diplomatic influence and as a means of advancing global well-being. Second, their understanding needs to be improved of the techniques and skills of human organization necessary to mobilize and coordinate efforts toward generally desirable goals. Third, it is necessary to enhance public and political understanding, support, and participation in setting and implementing diplomatic goals. More specifically, the U.S. diplomatic machinery needs to be strengthened at three points: in the Executive Office of the President, in the Department of State, and more broadly in all mission agencies with overseas programs, responsibilities, and contacts. Particular attention can be given at all of these points to reinforcing the constructive purposes of the United Nations.

THE EXECUTIVE OFFICE OF THE PRESIDENT

The institutional resources immediately available to the President need to address themselves to providing intellectual leadership in evolving intrinsically compelling diplomatic initiatives bearing on the long-range future course of international events and trends. They need to assure completeness in policies toward important contemporary questions of foreign policy generally. To these ends, there would seem to be a need for (a) a review and broadening of the policy definition of "the national security," (b) a close articulation by the President's adviser on international affairs and his staff of the activities of the National Security Council with those of the President's science and technology advisory apparatus, and (c) a clear Presidential insistence on effective performance by the Department of State in coordinating U.S. policy in the United Nations and in the exercise of international functions of U.S. departments and agencies.

The Executive Office of the President would also seem to need broader and more comprehensive contact and interaction with national public opinion leaders and with the technological community to identify significant trends and opportunities for new initiatives in technological diplomacy.

The Executive Office needs to be in position to challenge the Department of State to analyze its data bearing on technological diplomacy and to evaluate proposed policy initiatives in terms of providing constructive options for their implementation.

Clarification is needed of the respective roles of the Office of Management and Budget, the Department of State, the mission agencies of the Government, and the President's adviser on science and technology, in shaping U.S. participation in technical agencies and functions associated with the United Nations.

THE DEPARTMENT OF STATE

To some extent the role of the Department of State is analogous to that of the Department of Defense. Both departments are concerned with the maintenance of peaceful relations with other states, and with the preservation of the national security. The methods differ: the

Defense task is the maintenance of military potency and its use if necessary; the Department of State has the task of facilitating peaceful intercourse, negotiating the peaceful resolution of differences, and constructing durable, mutually beneficial relations with other nations.

Comparative priorities of war and diplomacy.—It is striking how disparate are the resources allocated to these two sets of functions, and how disparate also are the degrees of sophistication with which they are exercised. Defense maintains numerous research institutes, has contractual relations for studies with many universities, has a central strategic planning staff, operates many policy training institutions (four War Colleges, Industrial College, Naval Postgraduate School, Air University, etc.), three service academies, elaborate intelligence systems, and large publishing systems of manuals and textbooks. State's resources in the fields of policy and training—even in diplomacy—are dwarfed by comparison.

It could be contended that the conduct of diplomacy is a more exacting intellectual art than the conduct of war or military preparedness. And also, that preparation for diplomacy requires more information, more academic preparation, more research and analysis, than that for defense. And finally, that the investment in technology relevant to peaceful relations among countries, including foreign aid, bilateral programs, and multilateral projects of the United Nations, amounts to less than the budget for the development of new military technology. For both departments the study of technology, its applications and impacts, is of foremost importance in the present-day world; but while the study of technological factors in modern warfare is remarkably well developed, the study of ways to manage technology on a national and global basis to avert warfare situations is largely neglected.

Opportunities to strengthen diplomatic institutions.—The institutions of the Department of State were explored in one study of this series in an effort to identify those that could be amplified for the task. Few were found that could serve this purpose strongly or durably, and since then (spring, 1975) they have been further diminished.

What would seem to be needed is a stronger emphasis on long-range and mid-range planning of technological aspects of U.S. foreign policy, a gradual but steady increase in technological sophistication throughout the Department, improved access of the Department's technologists to the policy structure in the Executive Office of the President, a stronger role in coordinating the policy of international elements of mission agencies, and a closer and more constructive relationship with the technological community in the United States.

Separate units might be set up in the Department for planning on different time scales, with the long-range planning institution insulated from the day-to-day pressures of operational diplomacy and given a strong mandate and support by the Secretary to remain thus insulated, unlike its predecessors.

Both kinds of planning units might be supported by two kinds of research assistance under contract—a wholly funded, private, not-for-profit corporation like Rand or Aerospace, and a looser set of contractual relations with a number of academic institutions to perform research tasks on order or to conduct exploratory studies selected by themselves. The latter institutions might also maintain training programs for Department personnel on leave, or for Foreign Service candidates. Another educational approach to prepare personnel for policy planning assignments might be a program analogous to the National War College programs in which the case study approach is used.

External technical contacts of the Department of State.—Contact between the Department of State and the technological community could be enlarged in numerous ways: by reviving the Science and Technology Advisory Panel, the Secretary's science luncheons, and a vigorous science and technology program in the Foreign Service Institute. If revived, the Science and Technology Advisory Panel might be assured an increase in contacts not only with policy personnel of the Department but also with the "international" leadership elements of technological mission agencies; its effectiveness would be enhanced by the support of a strong and creative secretariat. Recruitment of more technologically trained specialists in the Foreign Service and "generalizing" them, or vice versa, is a possibility. A sabbatical program of advanced degrees in science policy for Foreign Service personnel could be considered. The oft-repeated suggestion by the House Committee on Science and Technology that the National Science Foundation be asked to set up a training program for Foreign Service personnel merits further attention. Extensive use of technological consultants to initiate as well as to review program options might be desirable. The use of the National Academy of Sciences, National Academy of Engineering, Institute of Medicine, and National Research Council is sanctioned by statute and precedent. Selection of some Ambassadors with technological expertise, and more generally the preliminary briefing of Ambassadors on the technological aspects of their function, seems to be essential if they are to make proper use of the technical people on their staffs. The availability to State Department personnel of extension courses and textbooks on science and technology policy might serve a useful purpose, assuming a motivation comparable to that of Department of Defense personnel. Exchange of personnel on detail with technological mission agencies on a more extensive basis would be helpful.

Limits and constraints on institutional reform.—All of these measures are possible means of strengthening the capacity of personnel in the Department to make use of technological expertise for diplomatic purposes. But none of them is likely to have the desired effect sought unless accompanied by an unequivocally strong commitment from the top. From the Secretary on down, the message would have to be clear that technology is a critical component of diplomacy. The Foreign Service never accepted the necessity to acquire language skills until the word came down from the top that they were important. The same message could motivate the effort to bring technological expertise into the service of the U.S. diplomatic community.

To provide an organizational center or focus for science and technology in the Department of State, the Murphy Commission proposed combining "science" and "economics" in the office of a new "Under Secretary for Economic and Scientific Affairs." He would have jurisdiction over four Assistant Secretaries: (1) for International Economic and Business Affairs; (2) for Energy, Transportation, and Communication Affairs; (3) for Oceans, Environmental, and Scientific Affairs; and (4) for Food, Population, and Development Affairs.

It can be observed that these subdivisions are not as logical as one might wish, nor are they complete in scope. Industrial technology, materials matters, and health are neglected, for example. Also eight "technologies" and a general "scientific" subject are subsumed under "scientific affairs." However, the principle of elevating the technological concerns of the Department of State to the level of Under Secretary could give status and visibility to a largely neglected, decisively important area of diplomatic concern and help to motivate Foreign Service personnel to familiarize themselves with the relationships between technology (and science) and diplomacy.

However, it should be noted that technological diplomacy cannot be concentrated within a single subdivision of the Department of State. It is of concern in the regional bureaus, the embassies, and the functional bureaus. Unless this fact is recognized in a practical way, the elevation of "science and technology" to Under Secretary status will remain a paper action. More functional change than organizational rearrangement of titles is called for. For one example, as the Murphy Commission pointed out, there is a "crucial link between technological capabilities and the enhancement of important military capabilities."

Moreover, it is unlikely that the strengthening of the Department of State could take place to any significant degree without the sympathetic understanding of the Congress and determined efforts by the Department itself. For the Congress to agree to supplying budgetary and legislative support for technology planning and programing by the Department of State requires that the Congress be satisfied not only that such support is needed in the public interest but also that it can be effectively used by the Department. The result of the congressional attempt to strengthen the Department's science office provides some negative evidence here. Elevation of the principal science officer to the level of Assistant Secretary and concentrating important technological functions under this officer did not of itself produce the result sought by the Congress. To elevate the level of "science" one more notch without assurance that the Department would take it seriously would not bring lasting change.

The Murphy Commission's emphasis on the relationship of technology (i.e., "science") and economics was reflected also in the attention given to the international diplomatic role of the Treasury Department. The point of this attention is the interaction of domestic and foreign technological development and economic growth. The question is whether strengthened technological sophistication should be provided in both Departments, and whether State should take a more purposeful and constructive stance toward domestic technology with international implications, or whether there should be a closer and more effective working relationship among three interested Departments, with Treasury leading in financial matters, Commerce in domestic technological matters, and State in trade, international technology, and diplomacy generally.

TECHNOLOGICAL MISSION AGENCIES

Seven departments and four independent agencies handle the bulk of technological activities of the Federal Government. A few of these have representatives in embassies abroad, and most have "international" offices to maintain contacts with foreign governments. The extent to which these contacts conform with U.S. foreign policy depends on the influence exerted by the Department of State both in Washington and over U.S. offices abroad. The scope of technological subject matter encompassed by these 11 agencies is enormous: military hardware, health and medicine, patents, standards, industrial trends, air transportation, geological surveys, mining and processing of ores, production of food and fiber, problems of cities, atomic energy and safeguards, aerospace, weather, technology transfer, scientific research and information exchange, environmental quality, ocean science and industry, and many more. Most of these technological subjects have significant impacts, present or prospective, on U.S. international relations. An abundant literature attests to the incapacity and disinclination of the Department of State as now constituted to monitor the policies of the mission agencies governing this range of subject matter. Periodic efforts at coordination through interdepartmental contacts, through the medium of the Federal Council for Science and Technology, and through the State Department's own Interagency Committee for International Science and Technology, have not even begun to bound the problem.

Institutional complexities.—Several agencies may be involved in a shared program with a single country. Bilateral and multilateral programs may overlap substantively. The approach to concerted technological diplomacy that involves all of these separate programs may be bilateral or multilateral; multilateral programs may be global or regional. The question that remains is how best to orchestrate the overseas technological programs of mission agencies to maximize their collective contribution to U.S. foreign policy objectives in ways most acceptable to the other countries involved, and at least cost to the United States. It is at least possible that the kind of regional approach described in the case study of the Mekong Project, and touched on further in the essay on bilateral versus multilateral diplomacy, might offer insights on ways to resolve this problem of coordination. Regionalism might provide the necessary combination of coherence in programing and economy of operation, in the noncontroversial support of mutually acceptable activities.

As matters stand now, it is difficult to know what coherent and purposeful U.S. policies are being pursued in Africa or Latin America, in the export or import of technology, in the support of world health, in the export of U.S. surplus grains, in the control of multinational corporations, in the allocation of world resources of petroleum and minerals, in the United Nations and associated institutions, in the expansion of nuclear power with or without reference to conflict with control of nuclear proliferation, in the encouragement of the world science community, in the use of survey satellites, in global communications, and generally in defining the significance of the overused word "interdependence" as a principle of U.S. diplomacy.

The need for multi-agency policy planning.—In the brief section updating the study of *Science and Technology in the Department of State* (pages 184–187) reference was made to 19 initiatives proposed by the Secretary of State in his address of September 1, 1975, to the U.N. General Assembly. These 19 proposals covered a wide range of technological matters on which policy was proposed. For example: an International Energy Institute, an International Industrialization Institute, an International Center for the Exchange of Technological

Information, a variety of agricultural institutions, and a system of international stockpiles of materials. In the preamble to these proposals the Secretary explained that they were being offered in recognition of the growing interdependence among the world's nations. However, before they can be converted from ideas to actualities, many further preparatory steps will be necessary: studies of possible consequences for United States and international economic and industrial health, differential effects on various national systems abroad, magnitude and costs, allocation of costs, substantive organizational planning, cost/benefit analyses at various levels of effort, justification before budget analyses, negotiation with representatives of other participating nations on alternative approaches, and solicitation of the views of the Congress, the executive branch, the informed public, and specialists in each particular field of concern.

The long-range implications of the whole package of 19 initiatives in relation to anticipated world trends would make a substantial separate study. All these are quite evidently time-consuming matters and not likely to be accomplished soon enough or vigorously enough to satisfy the impatient representatives of the "Third World" nations who listened to the Secretary's proposal. That it was constructive and conciliatory is evident; but whether it raised unrealizable expectations of early action remains to be seen.

Implications of the Study for the Congress

The Constitution divides responsibility for foreign policy between the President and the Congress. Commitments to treaties require a two-thirds Senate vote to approve of ratification. International actions requiring funding are subject to the legislative functions of appropriations and oversight. Appointments of diplomats and senior officials of the Department of State require that the Senate "advise and consent." However, the foreign relations of the United States at the time of the adoption of the Constitution and for more than a century thereafter were rarely so momentous as to engage the attention of the Congress. Only one of the 85 Federalist Papers (Number 64 by John Jay—dealing with the treaty power) addresses the subject at all. And Alexis de Tocqueville remarks on the singular incapacity of a democratic republic to maintain any sort of consistent foreign policy. In his view, such policy needed to be secret and in the charge of the smallest possible number of leaders, who would remain durably in control of it.

Indeed, the Tocqueville formula seems to have prevailed, more or less, from the early 1930s almost to the present, supported by the prevailing political arrangement that "politics stopped at the water's edge."

THE INCREASING CONGRESSIONAL ROLE IN DIPLOMACY

A number of coalescing factors have tended to excite a greater congressional concern for foreign policy and to motivate an apparent determination to participate in the process. These factors have included:

—A recognition that under conditions of the nuclear deterrent, the involvement of the United States in foreign policy can flow almost imperceptibly from peace into war, through successively deeper commitments abroad, so that the congressional authority to declare war requires continuous participation in decisions short of war;

—A recognition that massive investment of U.S. resources in particular initiatives of foreign policy (grain sales, for example) can affect the domestic economy and well-being;

—A recognition that global "interdependence" links the well-being of the domestic U.S. economy to foreign nations in many ways: dependence of U.S. industry on foreign minerals, dependence of U.S. consumers on imported petroleum, dependence of U.S. industries on foreign markets, the rise of a new attitude of global sharing of resources, and the evolution of a global system of money, credit, and trade;

—A recognition that major industrial corporations affecting the U.S. economy and employment are essentially international in scope and control; and

—A recognition that traditional reliance on the Presidential decisionmaking role in foreign policy initiatives tends to present the Congress with *faits accomplis* such that legislative support becomes virtually obligatory; to be a full participant in these initiatives the Congress must be a party to their planning.

Since the bulk of recent U.S. initiatives or reactive measures of foreign policy have tended to involve technology, the factors cited above are particularly germane to a study of the congressional role in science, technology, and American diplomacy. It seems evident that the onrush of technology requires that the Congress be systematically supplied with factual information about the world scene, with an inhouse capability for the analysis of this information, with its own experts in policy planning, and with information about results of programs for its own analysts to assess as a part of the oversight process. Presidential assurance of consultation on new initiatives before they are taken would be a logical further element.

NEED FOR STRENGTHENED INFORMATION SUPPLY

An oft-repeated assertion among political scientists is that foreign policymaking is inherently an executive function and that the legislative role cannot be other than secondary because the executive branch has exclusive possession of the vast flow of information from abroad. U.S. Embassies originate a flood of information cables and reports concerning events and trends in other countries. Mission agencies with offices or representatives abroad collect and publish statistics on military and naval force, agriculture, mining, health, education, and other topics. Intelligence—information from all sources that has been analyzed and evaluated—is a formidable (and closely held) resource. The systematic collection of detailed factual information is partly routine, partly in comment on significant new developments, and partly in response to inquiries from the home office. Taken altogether, this flood of information is an indispensable foundation for the design of long-range strategy and short-range reactions to foreign developments.

To reach independent judgments, the Congress needs a combination of basic data generated by the executive branch and the results of its own independent observations at first hand. However, it is unrealistic to expect that the Congress could build an information base comparable in depth of detail with that of the executive branch.

Moreover, the limited exposure that Members of Congress can allow themselves in overseas travel, while undoubtedly useful in establishing contacts and dialogues with U.S. representatives in foreign countries, has certain dangers as well. The information thus secured tends to be restricted in scope, and the limits of time for in-depth interviews and consultations subject such investigations to bias and superficiality that only longer and broader exposure of information sources in the country could balance out and correct.

Several legislative options are available to strengthen congressional information-gathering pertinent to foreign relations (in addition to those discussed below under the heading "Congressional Oversight of Foreign Policy Programs"). One possibility is to arrange a more extensive preliminary preparation for overseas investigations. Assignments to the General Accounting Office and Congressional Research Service could be used more systematically, in addition to assignments of committee staff, to assemble background data for staff analysis. These two services could be utilized for overseas data collection at U.S. Embassies and other foreign installations for use by congressional committees, members, and staffs. Additionally, CRS could make greater use in Washington of its mandate under the Legislative Reorganization Act of 1970: ". . . when so authorized by a committee and acting as the agent of that committee, to request of any department or agency of the United States the production of of such books, records, correspondence, memoranda, papers, and documents as the Service considers necessary. . . ."

Another possibility is the establishment of an intern or staff exchange program between the Congress and the Department of State. Familiarity with the information structure possessed by the Department (and perhaps the various mission agencies as well) could be increased by such a two-way exchange. This arrangement would help to obviate the longstanding difficulty facing the Congress in asking the right questions. The answers tend to be either shallow and unresponsive or excessively voluminous and unwieldy. Familiarity with the system could help to sharpen the questions and enable the Congress to insist on pertinent fact.

IN-HOUSE ANALYSIS CAPABILITY

Even the best information resources are of relatively little use if wheat cannot be sifted from the chaff. The Department of State wrestles perennially with this problem, and an improved flow of information to the Congress would raise the problem in a new setting.

The Murphy Commission proposed to solve this problem for the executive branch by creating a number of institutional modifications to structure the information. These included combining economic and political offices in embassies, better two-way communication to define and respond to needs from home, selection of ambassadors on the basis of technical qualifications, and strengthening of intelligence and analysis capabiities of the Departments of State, Treasury, Commerce, and Agriculture, and the Council of Economic Advisers. (Why not also Interior, Labor, HEW, ERDA, and the National Science Foundation?)

The congressional need for analysis of information relating to U.S. foreign policy is met in part by relevant committee staffs and three existing institutions: the General Accounting Office, the Congressional Research Service, and the Office of Technology Assessment. To assist Congress in coordinating major studies of these three offices and the Congressional Budget Office in all public policy fields, a new system of recordkeeping has been established as of January 1976. The purpose is primarily to avoid unnecessary duplication. The records may also indicate, however, where coverage is weak, and thereby serve to point to capabilities in need of strengthening.

The evidence presented in the Science, Technology, and American Diplomacy series of studies tends to support the frequently expressed opinion that existing analytical resources available to Congress in the foreign policy field are not adequate. It is for Congress to judge the extent of any related gaps or weaknesses and to decide whether the remedy lies in further strengthening existing organizations, adding new ones, or both. Congress is currently engaged in absorbing several new resources already available to it—the OTA, the CBO, and important new committees and subcommittees in both Houses. However, although many of these contribute to meeting the need for foreign policy analysis, collectively they fall short of providing full and balanced coverage.

One reason for the deficiency may be that there is no resource available to Congress which concentrates solely and comprehensively on the foreign policy/foreign affairs/international relations area. A sense that such a need may exist has given rise to various proposals for creation of a congressional office of foreign policy and national security analysis. If such proposals are considered unrealistic or premature, an alternative option might be to strengthen the foreign affairs component of CRS and couple with it a congressional service unit in the Department of State to assure that legislative needs for field research are met systematically and responsively.

Another possibility is that a study might be placed under contract with one or more outstanding academic or not-for-profit institutions to advise the Congress specifically on appropriate mechanisms for congressional acquisition and analysis of the flow of foreign policy information.

The Murphy Commission suggested the creation of a joint committee to weigh the interrelations among political, military, and economic aspects of foreign policy. It would include "leaders of the key foreign, military, and international economic policy committees from each House" and would receive and analyze reports from the President and from the intelligence community. However, there was no discussion of the staffing of such a committee. Since the effectiveness of the committee, and the calculations as to whether to establish it, could depend on the caliber of its staff and the nature of their proposed assignments, further exploration of this matter (e.g., by the House International Relations Committee) would seem appropriate as a guide to possible future action.

One indispensable element of analysis is continuity of information flow. The analyst in the process of reviewing and assessing the data given him must be in a position to go back to the source at any time for clarification or amplification of the facts at hand. It is a truism that policy is always made on the basis of incomplete information, but it is also true that improved completeness and reliability of information and greater depth of analysis produces improved policy. By whatever means, it seems important that the Congress provide itself with such service.

CONGRESSIONAL FOREIGN POLICY PLANNING

Heavy emphasis on the importance of long-range strategic planning of foreign policy, divorced from short-range preoccupation with reactive diplomacy, was stressed by the Murphy Commission as well as in the present study. However, the Murphy Commission focused on strategic planning in the executive branch; the present study contends that it is also an important function of the Congress and that some long-range planning should be performed in the legislative branch.

As executive branch institutions for strategic planning the Murphy Commission proposed (1) renewal of the practice of preparation and publication of a periodic Presidential "State of the World Report"; (2) the periodic preparation, by a "prestigious and independent organization of scientists" under delegation from both the executive and legislative branches, of a "Global Systems Critical List of Problems and Opportunities"; (3) creation of a "Council of International Planning," patterned after the Council of Economic Advisers, to concentrate on a few carefully selected problems; (4) assignment of specific long-range planning functions to members of the State Department's Policy Planning Staff; and (5) creation of an Advisory Committee of outside experts to serve as a bridge between the Policy Planning Staff and the scholarly community. The only reference to the Congress in this context had to do with review and hearings on the Global Systems Critical List.

Various legislative proposals were offered in 1975 for the creation of a joint committee on national security or strategic planning. A partial substitute might be a small congressional planning office, protected from the pressures of both partisanship and current operations by attachment to a Washington area university or foundation. Alternatively, the planning office could be associated with the Senior Specialist Division of the Congressional Research Service. In either case it should provide access to all appropriate congressional committees. The special requirements of the planning function in the congressional setting seem to call for the highest possible level of professional and technological expertise, insulated from short-range problems and issues, with permanent tenure unaffected by changes in political control or committee chairmanships. The planning office would provide the Congress with objective studies of broad perspective on the long-range goals and prospects, and ideas for initiatives to serve the goals and adapt to gradual changes in U.S. foreign relations. Insofar as technology plays a major role in modern diplomacy, this institution would require substantial technological expertise, but necessarily in combination with a strong international affairs capability.

The importance of insulation of such an institution from day-to-day problems does not imply its exclusion from contact with the Congress. On the contrary, the expert members of the institution could hold seminars, colloquia, workshops, and open consultations with visiting scholars for the benefit of interested Members of Congress as well as preparing in-depth analyses of the strategic concepts and proposed diplomatic initiatives for congressional consideration. An important

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function of the institution would be its help in the maintenance of continuity of congressional diplomatic policy, including support for pertinent executive programs, adjustment of national priorities and resource allocation, and assessment of major initiatives being developed by the executive branch.

CONGRESSIONAL OVERSIGHT OF FOREIGN POLICY PROGRAMS

The difficulty encountered by the Department of State in maintaining policy control of all aspects of U.S. foreign policy finds its counterpart in the difficulty of achieving comprehensive congressional oversight of the same field and for somewhat similar reasons. The Department is not staffed to maintain close technical surveillance of the foreign programs of mission agencies, of the broad array of United Nations activities substantially funded by the United States, nor of the long list of bilateral agreements and joint commissions with individual countries. Accordingly, there is no single source from which the Congress can obtain full factual reports on these activities for oversight purposes. If such information were promptly and comprehensively available to the Congress, it might be possible even with present staff resources of the Congress to make broad assessments of foreign policy programs. Even though the findings of an oversight committee of Congress may include recommendations with respect to which there is no assurance of executive compliance, experience has been that compliance is in fact prompted to a significant degree by congressional monitoring. During the past 5 years the House International Relations and Senate Foreign Relations Committees, in a joint effort with analyst support from CRS, have undertaken a sustained program of review and analysis of the several hundred executive branch reports submitted annually in compliance with about 350 separate requirements contained in foreign affairs legislation. A computerized record is kept of reports due and received. While this effort is only a beginning, it represents a more systematic and comprehensive approach in principle than the past practice of giving primary attention to obvious flaws in programs rather than attempting to monitor more broadly the totality of execution of U.S. diplomacy.

It is likely, therefore, that action to enhance foreign affairs accountability to Congress will entail strengthening both the State Department policy control of this field and the mechanisms of congressional review. Possible action regarding the Department might include a statutory strengthening of departmental policy authority over foreign activities of mission agencies. It might also include a requirement for joint interagency reports to Congress on substantive programs involving both State and another agency, or formalizing interagency committees (like the Interagency Committee on International Science and Technology) and charging them with responsibility to prepare annual reports of programs and activities within their cognizance. However, if the Congress is to be involved in the detailed oversight of interagency programs abroad, the twin dilemma must be faced of how, within constitutional bounds, to preserve intact both the President's authority to act swiftly and effectively in securing vital U.S. interests and the confidentiality of sensitive foreign policy information.

On the congressional side, strengthening moves could include intensification of recent efforts to exploit the computer facilities of Congress to build and maintain a current data bank of international activities and to enable more systematic checks on compliance with congressional mandates.

The availability of computer management of data also facilitates the analysis, for sustained oversight purposes, of the results of questionnaires addressed to foreign affairs action agencies by appropriate congressional committees about programs within their jurisdiction.

The use of exchanges of personnel between congressional and departmental staffs, already suggested as a possibility for other purposes, might also strengthen the congressional oversight function. At the same time, it could help to build a relationship between the Congress and the executive branch on foreign policy matters characterized by constructive cooperation and acceptance of the need to understand and reconcile important differences.

CONSULTATION ON PRESIDENTIAL INITIATIVES

Over the 200 years of U.S. history it has been a characteristic of some Presidents to act as their own Secretaries of State, for others to work in close relationship with their appointed Secretaries, and for a third group to leave diplomacy primarily in the hands of the Secretary. Illustrative of the first group were Presidents Wilson and Franklin Roosevelt. On the other hand, both Presidents Eisenhower and Nixon, while keenly interested in diplomatic matters, worked for most of their terms with Secretaries of State with strong personalities and a style of personal diplomacy. In either of these two conditions there was a tendency to bypass the Congress in the formulation of diplomatic initiatives. Only after decisions had been made and studies completed was Congress informed. In the event that a treaty was involved, however, the President took more pains to bring the Congress into a share of the action, as for example the preparations of Presidents Roosevelt and Truman for the general treaty creating the United Nations and President Kennedy's preparation for the Limited Nuclear Test Ban Treaty of 1963. However, in view of the deeper interest of the Congress in foreign affairs and the many reasons why this interest is likely to be sustained in the future, it seems reasonable to expect that congressional participation with the President in the shaping and winning acceptance of future foreign policy initiatives will involve greater scope and depth than in the past. If so, a deeply perceptive analytical capability will be required of the Congress in the exercise of its constitutional functions of foreign affairs. In this circumstance, it appears particularly necessary that the Congress provide itself with the technical support to match qualitatively the expertise of the executive branch.

Examples of attractive areas of future joint initiatives are cited in the present study. For example:

arms negotiations,
joint space ventures,
international technology assessment institution,
law of the sea,
enlarged program of global health care,
nuclear safeguards,

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regional development programs,
materials buffer stock network,
global food allocation and production enhancement,
food preservation technology transfer,
brain drain,
regulation of multinational corporations.

To these might be added other items cited by Secretary Kissinger's September 1, 1975, address to the U.N. General Assembly. Also, in the event the Murphy Commission concept of a "Global Systems Critical List of Problems and Opportunities" becomes a reality, it would open the way to congressional participation in the process of strategic planning. The Commission's suggestion of the National Academy of Sciences as a possible source to prepare such a list indicates the importance of science and technology as contributing elements of future diplomacy.

The prospect of congressional collaboration at the Presidential level in the planning of foreign policy initiatives postulates the need for senior-level expertise to backstop the congressional participants. Such support could be provided by one or more (or perhaps a consortium) of the Congressional Research Service, General Accounting Office, and the Office of Technology Assessment. Alternatively, a new institution suggested earlier in this study for long-range congressional planning of world trends and strategy might be considered. Such a group might also be organized as a special staff to support the proposed joint committee on national security, in the event that "national security" was redefined in broader than military terms.

Recapitulation of Major Points

The entire study of Science, Technology, and American Diplomacy has documented the importance of technical subjects for the content of U.S. foreign policy of the future.

The importance of technology was shown to require strengthening of the institutional arrangements for the conduct of diplomacy.

Planning of U.S. foreign policy was shown to require a longer time frame, a more positive and systematic approach in the origination of policy initiatives, and a recognition of the many ways in which the national interests of many countries are becoming interlocked.

Participation of both executive and legislative branches in the formulation of broad foreign policy goals and strategies was seen as essential under the changing conditions resulting from advancing technology. Increasing public awareness and consensus with respect to the national purposes from which foreign policy goals are derived—and with respect to the foreign policy goals themselves—was also seen as essential.

Congressional participation in the process was shown to require substantial support in the form of senior expertise in both technology and diplomacy.

The technical resources of the Department of State were shown to require strengthening to balance, in the field of peaceful technology, the organized intellectual resources of the Department of Defense in the field of military technology, the latter providing some useful models. A firm grasp of global strategy requires both kinds of expertise. In particular, the need was indicated for the State Department to lead the way in marshaling American managerial skills and technological expertise in the service of peace, as the Department of Defense has long been doing in support of military plans and operations. And finally, the foreign policy of the future was shown to require a cooperative approach by all participants, public and private, executive and legislative, United States and foreign.

In sum, there is no safety in separateness or intransigence in a nuclear-armed world; there is no moral justification for irrationality in a world in which technology can erase the sources of conflict.

SCIENCE, TECHNOLOGY, AND AMERICAN DIPLOMACY: A SELECTED, ANNOTATED BIBLIOGRAPHY BY SUBJECT

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INTRODUCTION

Most of the topics included in the series of studies on *Science, Technology, and American Diplomacy* continue to receive considerable attention by the Congress, the public, and academic and other researchers. An increasing number of journal articles, books, and legislative proceedings address these topics.

A principal purpose of this bibliography is to provide bibliographic references to relevant materials which have appeared since the publication of each study in the series. An attempt is made to cite materials which describe the evolution of the case or issue and which may collectively express contrasting points of view about programs or policies to deal with an issue. Each study in the series has extensive footnotes for primary materials consulted. Therefore this bibliography does not attempt to embrace citations for source materials used to prepare each of the separate studies. It does include a few significant items from the first (1970) bibliography published in this series: *Science, Technology, and American Diplomacy: A Selected, Annotated Bibliography of Articles, Books, Documents, Periodicals, and Reference Guides.*

A second purpose of the bibliography is to provide references for issues which were touched upon but not emphasized in preparing the analytical reports, and which have now surfaced as relevant components of the interface between diplomacy and science and technology.

Each author of a study in the series has suggested items to be included in this bibliography. Additional bibliographic services and primary sources were also used. A brief discussion of these is given for those readers interested in obtaining future publications dealing with the subjects covered in the bibliography.

The Congressional Research Service's computerized data bases, accessible through the SCORPIO system, were a major information source, primarily for journal articles and Government reports.[1] Citations for congressional publications were obtained from committee calendars, annual reports, and the *Congressional Information Service Index.* Several journals which customarily publish articles or book reviews relevant to the topics covered yielded many citations. These are: *Foreign Affairs, Perspective*, the *Annals of the American Academy of Political and Social Sciences*, and the *American Political Science Review.* All entries for papers cited with an FAR number were taken from the bibliographic series *Foreign Affairs Research Papers Available*, published monthly by the Foreign Affairs Research Documentation Center, Office of External Research, Department of State. This office lends available papers to Government officials.

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[1] SCORPIO is an acronym for Subject-Content-Oriented Retriever for Processing Information On-line.

KEY TO SECONDARY SOURCE ANNOTATIONS

Annotations or abstracts are given for most of the citations in this bibliography. In most cases the quoted material in the annotation comes from the document itself. However, in some cases quotations were taken from secondary sources, including book reviews of a document. These are indicated with a number which immediately follows the annotation. The sources are keyed as follows: (1) *Foreign Affairs*, (2) *Perspective*, (3) *CIS Index*, (4) *Annals of the American Academy of Political and Social Science*, and (5) *American Political Science Review*.

SCIENCE, TECHNOLOGY, AND AMERICAN DIPLOMACY: A SELECTED, ANNOTATED BIBLIOGRAPHY BY SUBJECT

TECHNOLOGY AND GLOBAL INTERDEPENDENCE: GENERAL ISSUES

Bloomfield, Lincoln P. "Analyzing Global Interdependence: Vol. I—Analytical Perspectives and Policy Implications." Report C 74–27, prepared for INR/XR, U.S. Dept. of State, November 1974, by the Center for International Studies. Massachusetts Institute of Technology. 138 p. USC/FAR Proj. No. 24002–73.

Available from the State Dept. as FAR 21043–S.

Other parts of the series deal with energy interdependence (FAR 21164–S); methodology (FAR 21165–S); and summary (FAR 21166–S.)

Bronowski, J. "The Disestablishment of Science." *Encounter*, v. 37, July 1971: 8–16.

"I have proposed two steps in the disestablishment of science: first, refusal to accept grants or contracts or projects directly from government agencies, and second, demand for a single national grant which is then to be allocated by the scientific community itself. There remains a third step in the more distant future, and yet it is the crucial step: the allocation of research as a single international undertaking."

Brzezinski, Zbigniew. *Between Two Ages: America's Role in the Technetronic Era.* New York, The Viking Press, 1970. 334 p.

The book attempts to define ". . . the emerging global political process which increasingly blurs the traditional distinction between domestic and international politics" and its meaning for the United States. "The first part deals with the impact of the scientific-technological revolution on world affairs in general, discussing more specifically the ambiguous position of the principal disseminator of that revolution—the United States—and analyzing the effects of the revolution on the so-called Third World. The second part examines how the foregoing considerations have affected the content, style, and format of man's political outlook on his global reality, with particular reference to the changing role of ideology. The third part assesses the contemporary relevance of communism to problems of modernity, looking first at the experience of the Soviet Union and then examining the overall condition of international communism as a movement that once sought to combine internationalism and humanism. The fourth part focuses on the United States, a society that is both a social pioneer and a guinea pig for mankind * * *. The fifth part outlines in very broad terms the general directions that America might take in order to make an effective response to the previously discussed foreign and domestic dilemmas."

Brown, Lester R. *The Interdependence of Nations.* [New York] Foreign Policy Association [1972]. 79 p. (Headline series no. 212.)

Discusses economic, ecological, resource, technological, and social interdependence.

Brown, Seyom. *New Forces in World Politics.* Washington, D.C., The Brookings Institution, 1974. 224 p.

"The disintegration of cold-war alliances and various challenges to the traditional nation-state system fundamentally affect world politics today. The author . . . finds the sources of both these trends in technological, economic, and cultural changes that can be reversed only at great political cost. He foresees a world in the last quarter of this century in which nations, groups within nations, and transnational special interest groups will be competing for popular support and loyalty. The resulting lack of political coherence, he believes, is likely to coincide with technological developments that render close coordination among societies imperative if basic security, health, and welfare needs are to be met. He concludes that all this bodes ill for world order and justice unless efforts to improve international decision-making processes are successful. To that end, he offers guidelines for U.S. foreign policy responsive to the urgent need for international coordination in the years ahead."

Brown, Seyom and Larry L. Fabian. "Toward Mutual Accountability in the Nonterrestrial Realms." *International Organization*, v. 29, no. 3, Summer 1975: 877–892.

"The inherited international regimes for the ocean, outer space, and the weather—based largely on the principles of open access and free use—are inappropriate to the emerging needs in these realms for efficient and equitable allocation of resources and for conflict management. Neither a substantially greater exercise by national governments of management authority, nor a marginalist approach to increasing the authority of functionally-specific international institutions will suffice. A major commitment to expand and strengthen processes of international accountability among the users of these realms is required. Institutional targets for the mid-1980's should include a comprehensive ocean authority; an outer space projects agency; a global weather and climate organization; and an international scientific commission on global resources and ecologies. Transitional strategies, of a marginal and functionally-specific nature, however, will be required in the meantime, directed toward internationalizing information on the nonterrestrial realms, drawing the relevant actors into consultative arrangements, and limiting current unilateralist trends."

Camps, Miriam. *The Management of Interdependence: a Preliminary View.* New York, Council on Foreign Relations [1974]. 104 p. (Council on Foreign Relations. Council papers on international affairs, 4)

Looks at some of the "management" problems the international system will face in the 1980's and at some of the relationships it seems to be desirable to encourage in four major areas: security, management of natural resources, development, and management of natural resources including the ocean, space and seabed.

Casey, William J. "Science and Technology and World Economic Affairs." *Dept. of State Bulletin*, v. 69, Nov. 19, 1973: 630–634.

U.S. Undersecretary of State for Economic Affairs discusses U.S. stake in technological innovation and its relation to economic and international affairs.

Choucri, Nazli and Robert C. North. *Nations in Conflict: National Growth and International Violence.* San Francisco, Freeman, 1975. 356 p.

"Taking the period from 1870 to 1914 as case material, this controversial work will no doubt rank as a landmark in the quantitative analysis of international relations and specifically of the sources of conflict. In particular, it assesses the indices of power of the key nations and traces the origin of war to the consequences of different paces of national growth—economic, demographic, and technological." (1)

Daddario, Emilio Q. "National Science Policy—Prelude to Global Cooperation." *Bulletin of the Atomic Scientists*, v. 27, June 1971: 21–24.

"A national science policy is needed to 'provide the goals, priorities and needed direction for the nation's scientific enterprise in the last quarter of this century,' suggests former Congressman Emilio Q. Daddario. He proposes also a new type of cooperative mechanism, an International Science Policy Committee."

Dahlberg, Kenneth. "The Technological Ethic and the Spirit of International Relations." *International Studies Quarterly*, v. 17, Mar. 1973: 55–88.

". . . the attempt will be made here to show that the large-scale applications of technology that so influences national and international actions and environments are inextricably tied to a particular constellation of Western values and perceptions which I shall call the technological ethic."

"Enlarging Cooperative International Efforts in Science and Technology." Message from President Nixon to the Congress (Excerpts.) *Department of State Bulletin*, v. 66, April 10, 1972: 547–548.

Fox, W. T., "Science, Technology and International Politics." *International Studies Quarterly*, v. 21 no. 1, March 1968: 1–15.

"As the superpowers of the 1960's have been discovering that they can neither make war on nor make peace with each other, the arms race between them has been giving way to a space race, itself part of a larger science and technology race. This article discusses the impact of science and technology upon the international political scene. The post war experience, Fox states, has been greatly affected by the power positions in nuclear weapons proficiency and, on another level, success in the space race. He suggests that Soviet-American competition in the science race is having a benign effect on world politics . . . the science race tends to keep the arms race qualitative, thus keeping each side from feeling that it is sufficiently prepared to resort to trial by battle. Thus, the science race may have promoted the 'deceleration of history'. All over the world there are problems too important to ignore, but not important enough to cause Washington and Moscow to choose to destroy each other. So history slows down, the problems remain, and some of them grow daily more menacing. On the other hand, Fox suggests that this competition must look to the needs created by our national deficiencies and to the requirements of less advantaged people. For the world as a whole the minimum requirement is set by the competition of national systems not with each other but with nature itself."

Goodwin, Geoffrey L. and Andrew Linklater. *New Dimensions of World Politics.* New York, Halsted Press, 1975. 127 p.

"The symposium gives a survey of new scientific and economic developments and transnational factors influencing world politics, and of available theoretical perspectives." (1)

Haberer, Joseph. "Politicalization in Science." *Science,* v. 178, Nov. 17, 1972: 713–724.

Discusses "first, the politicalization of science, then the shift from an international to a national orientation of the scientific enterprise, and finally the professionalization of the community of science."

Haas, Ernst B. "Is There a Hole in the Whole? Knowledge, Technology, Interdependence and the Construction of International Regimes." *International Organization,* v. 29, no. 3, Summer 1975: 827–876.

"This essay seeks to make the following points: (1) The search for holistic intellectual constructs to legitimate the construction of international regulatory regimes is fruitless if it is based on some notion of naturalness suggested by science itself. The purposes to be served by the use and regulation of science and technologies cannot be subordinated to the scientific attributes of the activities to be regulated. (2) Darwinian evolutionary propositions concerning survival imperatives are not adequate guides for the definition of political purposes governing the international regulation of science and technology. (3) If holistic constructs are not fruitful as organizing devices entirely disaggregated and fragmented solutions to technological problems are self-defeating in terms of achieving political purposes. What kind of knowledge do we have to suggest the creation of cognitive links among parts which add up to wholes consistent with political purposes as units-to-be-regulated? The identification of links demands a closer type of cooperation among technical experts and political decision-makers than practiced hitherto. Hence a notion of the public interest is advanced to suggest the identification of links through new types of institutions and procedures for combining scientific with political knowledge. (4) Wholes to be identified through such processes can be analyzed in terms of the language of complexity and decomposability, leading to various notions of interdependence. Political purposes and technological developments are discussed jointly to show how a given concern can be characterized by different kinds of interdependencies at different times. 'Interdependence' then emerges as a multidimensional and dynamic device for identifying wholes. (5) Various types of interdependence are matched to various forms of international organizational cooperation and the evolution of organizations is examined in terms of learning to manage interdependence. (6) By combining organizational forms with changing political purposes we arrive at provisional wholes called 'technology-task-environments' which permit the scientist and the politician to contribute jointly to the management of interdependence issues triggered by changing technologies and scientific ideas until the evolving mix of knowledge and purpose leads them to construction of alternative (but equally temporary) wholes."

Hamilton, David. *Technology, Man and the Environment.* New York, Scribners, 1973. 357 p.

"This exhaustive review of developments in major areas of technology provides valuable concepts and data on the worldwide consequences of technological progress." (1)

Jenkins, Brian M. "High Technology Terrorism and Surrogate War; The Impact of New Technology on Low-level Violence." RAND Paper P–5339, Jan. 1975. 26 p. Available from the State Department as FAR 21846–P.

Kahn, Herman. *A Slightly Optimistic World Context for 1975–2000.* Croton-on-Hudson, N.Y., Hudson Institute, 1974. 13 l. (Hudson Institute. Research memorandum no. 8). At head of title: Corporate environment program.

Expects "economic growth to continue to increase well into the twenty-first century," and expects that "by the year 2000 most of the world's population will be very well off by today's standards."

Kahn, Herman. *Ten Alternative Global Projections for 1975–2000.* Croton-on-Hudson, N.Y., Hudson Institute, 1974. 12 l.

Presents ten projections of what might happen in the world (1975–2000) six are described as "surprise-free projections" and the others are listed as "unlikely worlds".

Kahn, Herman and William Brown. *A World Turning Point—and a Better Prospect for the Future.* Croton-on-Hudson, N.Y., Hudson Institute, 1975. 21 l. (Hudson Institute. Research memorandum no. 13). At head of title: Corporate environment program.

"We are now or probably soon will be passing through an inflection point for world growth rates of both population and production. In other words, these rates are now at historic high points, after which they will gradually decline and level off, producing a generally affluent world about a century hence."

King, Alexander. *Science and Policy: the International Stimulus.* London, Oxford University Press, 1974. 110 p.

The author is former director-general for scientific affairs of the OECD. He notes "Science and technology have been important ingredients in the building of the kind of world we enjoy and suffer today. Research activity has expanded greatly in the last few decades in all industrialized countries and now amounts to a sizeable proportion of the gross national product. Funds for research and development come mainly from governments, although industrial contributions are great. These circumstances, in which the promise offered by new discovery is greater than the resources available, have necessitated the creation of national policies and priorities. Furthermore, increasing scale and cost have encouraged the sharing of research internationally. This book sketches the evolution of such policies on an international basis, outlines the main issues, and gives some indication of future trends, particularly in relation to the need to use the scientific approach to solve not only material and economic problems but also those of society."

Kintner, William R. and Harvey Sicherman. *Technology and International Politics: The Crisis of Wishing.* Lexington, Mass., D. C. Heath and Co., 1975. 175 p. (Institute Book Series of the Foreign Policy Research Institute, Philadelphia.)

The authors attempt to describe the impact of technology on four aspects of international politics: war and peace, political integration, modernization, and resources. The book argues basically that the most important aspects of modern technology, research and development, generate uncertainty in nation-states. This is an ambiguous impact. Although it may weaken the power of a state, in the end it will strengthen a nation's sovereignty. This book therefore stands in contrast to those studies which hypothesize that technology will automatically lead to interdependence of nations.

Meadows, Dennis and Donella H. Meadows., eds. *Toward Global Equilibrium; Collected Papers.* Cambridge, Wright-Allen Press, 1973. 358 p.

"Technical papers by *The Limits to Growth* team dealing with raw materials, pollution, population, methodology and ethics."

Mesarovic, Mihajlo and Edward Pestel. *Mankind at the Turning Point: the Second Report to the Club of Rome.* New York, Dutton/Reader's Digest Press, 1974. 210 p.

"The quest for an alternative to the deadly endings traced in *Limits to Growth* has produced a more sophisticated computer model. While stressing global interdependence, this one deals separately with regions and permits the testing of a variety of assumptions. The results reported here still point to danger, but make a case for "differentiated growth," international cooperation, and coordinated action across a wide front." (1)

Morgenstern, Oskar, Klaus Knorr, and Klaus P. Heiss. *Long-Term Projections of Power: Political, Economic, and Military Forecasting.* Cambridge, Ballinger, 1973. 229 p.

"This trenchant discussion of forecasting recommends skepticism and a mixed approach. Energy, which the authors regard as particularly important in judging power, and China, which they find the hardest country to make projections about, receive special attention. Familiar faces such as the Club of Rome and Herman Kahn are inspected rather quizzically." (1)

Ogburn, William Fielding, ed. *Technology and International Relations.* Chicago, The University of Chicago Press, 1949. 198 p. plus index.

Written soon after World War II when important developments in transportation, communications, and power began to impact upon the changing political order, this compilation of readings assesses the implications of scientific and technological developments on U.S. international policies. Essays relate to acceptance of new technologies, impact of technology generally on political development, military weapons development and international relations, and impacts of specific developments, steam and steel, aviation, atomic energy, and mass communications on international relations. While much attention is devoted to the relations between the United States and Europe, and the United States and the Soviet Union, some discussion is devoted to relationships with the developing countries.

The Planetary Bargain: Proposals for a New International Economic Order to Meet Human Needs. Report of an International Workshop convened in Aspen, Colorado, July 7–August 1, 1975. A Policy Paper/Aspen Institute for Humanistic Studies, Program in International Affairs. 1975. 36 p.

"The 'planetary bargain' is our name for the sum of practical arrangements for a new international economic order . . ." required to perform global functions. The report argues that governments, acting alone, do not look at policy formulation from an international point of view; this view is required to cope with increasingly interdisciplinary complex systems. The report lays out the structure of the new international institution and the relationships of governments to it. In particular the report describes new functions of the organization: "The international system should work toward the use of 'extranational' bodies (comparable to the European Commission)—plural executives which can take international initiatives at the political level. One or more such bodies will be needed to (a) formulate international standards for minimum ('first floor') human needs; (b) help countries evaluate alternative development strategies; (c) analyze national plans for meeting human needs; (d) collect taxes and fees for the use of international 'commons'; (e) allocate these funds to carry out plans to meet human needs and (f) monitor the implementation of these plans."

Rabinowitch, Eugene. "Back into the Bottle?" *Science and Public Affairs,* v. 29. Apr. 1973: 19–23.

Discusses the downgrading of science by the administration and urges more participation by scientists in man's affairs, including some sort of international science council.

Rettig, Richard A. *Bibliography on Science and World Affairs.* Prepared for the Foreign Service Institute, U.S. Department of State. Nov. 1964. [Washington], U.S. Government Printing Office, 1965. 179 p.

Partially annotated bibliography, topically arranged, of books and articles on science and world affairs for foreign service officers; inclusive to November 1964. Major social science and scientific periodicals are covered. Subject areas include "science, society, and the polity, science and world affairs, World War II and the aftermath, the peaceful atom, systems and strategies in nuclear war, arms control and disarmament, outer space, foreign aid, cultural relations, international organization, international scientific cooperation, and comparative systems."

Ritchie-Calder, Lord. "Global Science Policy." *Science,* v. 183, March 22, 1974: 1147.

Discusses the work on the Center for the Study of Democratic Institutions on the topic of global science and technology policies. The author notes one of the proposals to emanate from this work, i.e. ". . . that the now redundant [U.N.] Trusteeship Council be replaced by a Scientific Council on the level of the Security and Economic and Social Council so that the issues would be aired and continually reviewed."

"Role of Science and Scientists in National and World Affairs." *Pugwash Newsletter,* v. no. 1, July 1969: 4–15.

"A report of the Fifth Pugwash Symposium (May 1969) on the above topic is presented. The report lists the symposium participants and the papers presented. The related discussions and recommendations are summarized in some detail under seven headings:

Impact of Science and Technology on Society.
The Relationship Between Science and Politics.
Science and Society.
International Scientific Organizations.

National Scientific Organizations.
Inter-disciplinary Research.
Responsibilities of World Scientific Community." (4)

Ruggie, John Gerard. "International Responses to Technology: Concepts and Trends." *International Organization*, v. 29, no. 3, Summer 1975: 557–584.

An essay which lays out the theoretical organizing concepts of the essays which comprise the symposium issue dealing with international science and technology. The essay details concepts of collective action and collective response created by the interaction of technology and international politics and, based on the papers presented, gives a discussion of the implications for the design of future international organizations.

In greater detail:

"Physical and technological parameters are important determinants of international responses to technology when those responses concern research, scanning and monitoring, and problem recognition in general—when, in a word, the issue is to *discover* or *understand* some process or situation. When, however, the issue is to *manage* some process or situation, the weight of political purposes becomes preponderant. For, the same response that maximizes fisheries catch, to cite an example, may reduce employment, or the same response that sets higher standards of environmental quality may reduce trade potential, or the same response that increases technological efficiency may lower foreign exchange earnings. In fact, the same response may well do all simultaneously. Deciding among them is not a question of physical and technological determinants; it is a question of social choice."

"By introducing political purposes into the equation linking technological change to international organization we considerably complicate our descriptive and prescriptive tasks. International organization is itself then no longer a simple *response* to technology, but, rather, a more complex *product* of the intersection of two axes. Along the first is plotted the tension between science, heavily informed by consensual knowledge of cause/effect relations, and politics, heavily informed by normative purposes, negotiated priorities and available capabilities. The outcome of this tension may be said to define the *situation* which science and its products will have occasioned. Along the second axis is plotted the tension between the need of states to respond collectively to problems and opportunities such situations contain, and their desire to maintain national autonomy and flexibility in so doing. The outcome of this tension may be said to define the *response* which a new situation will have occasioned. These two axes, together with the concepts of situation and response taken over a group or collectivity of nations—that is, *collective* situation and *collective* response—define the analytical boundaries of the studies that follow."

Salomon, Jean-Jacques. *Science and Politics*. (Translated from the French by Noel Lindsay.) Cambridge, The MIT Press [1973]. 277 p.

"Salomon objectively poses those questions about values, science, and politics that lie at the heart of the contemporary debate about the moral ends of science and technology. Most of his cases are drawn from the American experience, and relate to research subsidized by the government for military purposes." Chapter 9 deals with international science, and limitations posed by nationalism.

The author is head of the science policy directorate of the Organization for Economic Cooperation and Development.

Scheel, Walter. "Technology as an Element of Foreign Policy." *Aussenpolitik*, v. 23, no. 3, 1972: 243–251.

West Germany's Minister of Foreign Affairs defines science and technology as a new dimension of foreign policy.

Schilling, Warner R. "Technology and International Relations." *In International Encyclopedia of the Social Sciences*. v. 15, New York, the Macmillan Company and the Free Press, 1968. p. 589–598.

Mr. Schilling describes "how technological developments of the past three centuries have effected significant changes in every element in the international political process (actors, ends, expectations, means, and system)." He then analyzes major facets of the interaction: characteristics, trends and prospects. Includes selected but extensive bibliography on the subject.

Stanley Foundation. Fifteenth Strategy for Peace Conference Report, October 17–20, 1974. Muscatine, Iowa, The Stanley Foundation, 1974. 76 p.

The conference, which brought together academics and policy makers, emphasized the interdependence of the world in foreign policy and technological issues. The following topics were covered: the Non-proliferation treaty, Development decision-making, "Keeping the Peace," Southeast Asian neutralization, Conventional weapons control, and International cooperation in outer space.

Sterling, Richard W. *Macropolitics: International Relations in a Global Society.* New York, Knopf, 1974. 648 p.

"Confronting the doctrine of political realism, Professor Sterling argues persuasively that new global forces (compression of time and space, the universal quest for development and justice, and the emergence of transnational actors) have transformed international society and necessitate the macro-perspective . . ." (1)

Suttmeier, Richard P. "Revolution in Post-Industria or Revolutionary Post-Industria? An Exercise in Speculation on the Future Political Role of Science and Technology." Paper presented at the Annual Meeting of the International Studies Association, Washington, D.C., February 1975. 32 p. Available from the State Department as FAR 22426–P.

"Symposium: The Impact of Science and Technology on International Law." *California Law Review*, v. 55, no. 3, May 1967: 407–534.

"Advances in science and technology during the past few decades have accelerated the growth of international law as a creative force in organizing and regulating cooperative projects among nations. International control over the utilization of new discoveries, however, has not been realized. Methods to accomplish this goal must be discovered within our existing legal framework or developed through other institutions. The topics discussed in this symposium present a clear challenge for international law to acquire and maintain effective control over the potentially destructive technological revolution." Subjects included are "Scientific Advances and International Lawmaking," Oscar Schacter; "Communication Satellites: International Organization for Development and Control," Stephen E. Doyle; "Law, Technology and the Sea," Douglas M. Johnston; "Criteria for Long-Range Nuclear Control Policies," Herman Kahn and Carl Dibbie; "Weather Modifications and Control: Some International Legal Implications," Howard J. Taubenfeld; and "The Space Treaty: A Preliminary Evaluation," Ivan A. Vlasic.

Technology, The Nation-State, Population Control and the Third World. Including: Alexander King, "The Challenge of Science and Technology to Traditional Concepts of National Sovereignty; and Gerard Piel, "Population Control by Economic Development. "*In* Neal, Fred Warner and Mary Kersey Harvey, eds. American Foreign Policy in the Age of Interdependence. Vol. III of four volumes edited from the proceedings of PACEM IN TERRIS III, A National Convocation to Consider New Opportunities for United States Foreign Policy, Convened in Washington, D.C., October 8–11, 1973 by the Center for the Study of Democratic Institutions, pp. 79–157 (including discussion).

King "draws on his experience as Director-General of the Organization for Economic Cooperation and Development in Paris and his activities as a leader of the Club of Rome to make a powerful and comprehensive analysis of the challenge of modern science and technology to traditional concepts of national sovereignty. He is followed by Gerard Piel, publisher of *Scientific American*, who returns to the need for development, especially as it affects population growth."

The other edited volumes of proceedings are entitled: Vol I: The Nixon-Kissinger Foreign Policy: Opportunities and Contradictions, Vol. II, The Military Dimensions of Foreign Policy, and Vol. IV, The Requirements of Democratic Foreign Policy.

Todd, W. M. and John Voss. "The Consortium of Academies: a New Way to Found International Scholarly Institutions." *Bulletin of the Atomic Scientists*, Feb. 1971: 29–32.

A review of proposals set forth for international cooperation between national academies of science, including their rationale. Particular attention is given to the proposal to create an International Foundation for Science, originally called the International Science Foundation.

U.S. Congress. House. Committee on Foreign Affairs. Subcommittee on National Security Policy and Scientific Developments. *Strategy and Science: Toward a National Security Policy for the 1970's.* Hearings, 91st Cong., 1st sess., March 1969. Washington, U.S. Govt. Print. Off., 1969. (House Document No. 91–185).

Assessment of how science and technology have influenced foreign policy considerations, both civilian and military.

U.S. Council on International Economic Policy. *International Economic Report of the President; Together With the Annual Report of the Council on International Economic Policy.* Washington, For sale by the Supt. of Docs., U.S. Govt. Print. Off., 1974. 113 p. Contents.—U.S. international economic policies.—The U.S. position in a changing world.—Some implications of the energy crisis for the United States and the world economy.—The United States role in world agricultural trade.—Policy issues concerning foreign investment in the United States.—U.S. banking and securities regulation—some consequences for international finance competition.—International technology transfer.—New approaches to foreign trade in Communist countries.—Economic aspects of the law of the sea.

United Nations. Educational, Scientific, and Cultural Organization. *1973 Provisional World List of Periodicals Dealing with Science and Technology Policies.* Paris, UNESCO, New York, Distributed by UNESCO publications Center, 1974. 112 p. (Science policy studies and documents, no. 33(2).)

United Nations. Secretary General (Waldheim). *Protection of Broad Sectors of the Population Against Social and Material Inequalities, As Well As Other Harmful Effects Which Might Arise From the Use of Scientific and Technological Developments: Report.* New York, 1975. 62 p. (United Nations. [Document] A/10146)

At head of title: United Nations General Assembly.

United Nations. Secretary-General (Waldheim). *The Role of Modern Science and Technology in the Development of Nations and the Need to Strengthen Economic and Technico-scientific Co-operation Among States.* New York, 1973. 10 p. (United Nations. [Document] E/5238)

Presents general recommendations. A more detailed treatment, appears in Lord Ritchie-Calder's addendum (E/5238/Add.1).

At head of title: United Nations Economic and Social Council.

The White House Conference on International Cooperation. November 28–December 1, 1965, Washington, D.C. *Reports prepared by Committees of the National Citizens' Commission on International Cooperation for Presentation at the White House Conference on International Cooperation.* Washington, U.S. Government Printing Office, 1965.

Includes Committee reports on: Agriculture and Food, Arms Control and Disarmament, Aviation, Business and Industry, Communications, Culture and Intellectual Exchange, Disaster Relief, Education and Training, Finance and Monetary Affairs, Health, Human Rights, Labor, Manpower, Natural Resources Conservation and Development, Peacekeeping Operations, Peaceful Settlement of Disputes, Peaceful Uses of Atomic Energy, Population, Research on Development of International Institutions, Science and Technology, Space, Technical Cooperation and Investment, Transportation, Trade, Urban Development, Women, and Youth Activities.

C

FORMULATION OF FOREIGN POLICY WITH A SCIENTIFIC OR TECHNOLOGICAL CONTENT: THE UNITED STATES

Bacchus, William I. "Diplomacy for the 70's: an Afterview and Appraisal." *American Political Science Review*, v. 68, no. 2, June 1974: 736–748.

The author was a staff member of the Commission on the Organization of the Government for the Conduct of Foreign Policy. "Numerous attempts have been made since World War II to reform U.S. government structure and procedures for managing foreign affairs, but success has been distinctly limited. In evaluating the procedures, proposals, accomplishments, and failures of the most recent State Department reform program, this review suggests some reasons why rationalization of foreign affairs organization has been so difficult to achieve. Unless fundamental questions of the Department of State's appropriate relationship to the rest of government are confronted directly, it is impossible to deal effectively with international organizations, operations, and staffing. Yet because of a restricted mandate, *Diplomacy for the 70s* did not address itself to these priority questions. And for a number of reasons, including a misplaced belief in the efficacy of management reforms as contrasted with political initiatives, lack of aggressive senior level support, ineffective followup, and budgetary restrictions, it fared no better than previous reform programs, even taken on its own limited terms. Unless such basic problems are dealt with, future reform attempts are likely to be no more successful."

Bacchus, William I. *Foreign Policy and the Bureaucratic Process: the State Department's Country Director System.* Princeton, Princeton University Press, 1974. 350 p.

"The State Department in 1966 established a system of country directors, individuals responsible for all American activities with particular countries, single focal points in Washington to serve our Ambassadors. This study, a sensible blend of empirical data and theory, describes the gap between expectation and reality, based on interviews with 46 of the 49 country directors and nearly 100 others involved with them." (1)

Berkner, Lloyd Viel. *Science and Foreign Relations: International Flow of Scientific and Technological Information.* Washington, International Science Policy Survey Group, 1950, VIII, 170 p. U.S. Department of State, Publication 3860, General Foreign Policy Series, No. 30.

"A report prepared by the Department of State and reviewed by a select committee of the National Academy of Sciences. Covers such topics as collection and dissemination of foreign scientific information; support of international scientific organizations and conferences; educational exchange; technical assistance; controls over international flows of scientific information and persons; and the role of science in formulation of foreign policy. Appendices document Department of State's international scientific activity."

Among the recommendations made by the group were creation of a Science Office in the Department of State and establishment of a science attaché program at American embassies.

Chinn, Herman I. "International Scientific Co-Operation." *Bulletin of the Atomic Scientists*, November 1969 : 34–5, 47.

"Everybody talks about international scientific co-operation, but what are we really doing about it? Dr. Chinn, . . . Science Officer in International Scientific and Technological Affairs of the U.S. Department of State . . . takes a hard look at what is happening in that much-discussed area, and makes viable suggestions for improvement."

Commission on the Organization of the Government for the Conduct of Foreign Policy. [*Report*] June 1975. Washington, U.S. Govt. Print. Off., 1975. 278 p.

The Commission was established by P.L. 92–352, to submit findings and recommendations to develop a more effective system to formulate and implement foreign policy. This volume summarizes the major findings. It treats: "The purposes of organizations, [which] outline the importance of sound organizations and decision processes, and discusses the functions that effective organization can and cannot perform. It then suggests the general characteristics of the foreign policy problems of the near future with which any organizational arrangements will have to contend." The next section "The President and the State Department, spells out the Commission's main recommendations concerning the organization of the Executive Office of the President, and the Department of State." The section entitled "The Conduct of Foreign Policy, discusses changes in organization which might improve the formulation and conduct of various specific aspects of foreign policy, and contains additional recommendations concerning the White House and State Department as well as the Departments of the Treasury, Defense, and the Intelligence Community. Aspects of congressional organization are also discussed." The last section, "Executive-Congressional Relations and the Organization of the Congress," relates a number of the recommendations made concerning the executive branch to proposed congressional changes, and reviews the means by which executive and legislative branches of government can work together more effectively to carry out their mutual responsibilities for foreign policy.

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    a. Congressional Leadership and Foreign Policy by Senator Mike Mansfield.
    b. Congressional Party Leadership and the Impact of Congress on Foreign Policy by Randall B. Ripley.
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2. Alternative Organizational Models for the Conduct of Foreign Policy by William I. Bacchus and R. Roger Majak.
3. Problems in the Conduct of United States Foreign Policy: A Compilation of Recent Critiques by J. Daniel O'Flaherty.

Crawford, Elisabeth T. and Albert D. Biderman, eds. *Social Scientists and International Affairs: A Case For A Sociology of Social Science.* New York, John Wiley and Sons, Inc., 1969. 333 p.

"This book examines the relationship between social scientists and the activities of the U.S. Government in the international field since the beginning of World War II. The plan for this volume of reprinted articles, commented on by the editors and supplemented by an extensive bibliography, was developed in the course of a research project supported by the Behavioral Sciences Division of the Air Force Office of Scientific Research on the use of social science knowledge in international and military affairs." The writings of outstanding social scientists are represented. Topics covered include: "perspectives on the social roles" of social scientists; the social organization of policy-oriented social science; the relationships between social science research and policy needs, and the functions of policy-oriented social science. Excellent annotated bibliographies treating many of the topics discussed are included. Also appended are materials on "the organization of policy-oriented social science" in the government, governmental "decisionmaking structures and use of social science research," and "the substance of social science knowledge and policy concerns in international and military affairs."

DuBridge, Lee A. "Policy and the Scientists." *Foreign Affairs,* v. 41, no. 3, Apr. 1963: 571–588.

Assessment of the contributions and limitations of scientists and engineers in government and those called upon for consultation in particular policy areas. In-depth coverage of the Office of Scientific Research and Development, the Atomic Energy Commission, the President's Science Advisory Committee, the National Science Foundation, the National Aeronautics and Space Administration; cursory coverage of other agencies and departments. Illustrates the frequent disagreement among scientists and the difficulty of characterizing the "rightness" or "wrongness" of scientific advice received by the government. Mr. DuBridge concludes: "One who has had full access to the record cannot help but be proud of the way in which the Nation's best scientists, when brought into responsible posts in public affairs, have carried out their tasks conscientiously, selflessly, intelligently—and often with great brilliance and breadth of vision."

Etheredge, Lloyd S. "Personality & Foreign Policy: Bullies in the State Department." *Psychology Today,* v. 8, March 1975: 37–40, 42.

"The man to watch out for is mature, sophisticated, proud of himself, ambitious, and itching for power. If he's low in his trust of others, he projects his private world on ambiguous international situations. The first good study on the willingness to wage war—or dodge it—among military and State Department professionals."

"Federal Funding of Foreign Affairs Research." *FAR Horizons,* v. 7, no. 1, Winter 1974: 5–8. (Newsletters of the secretaries committee, Subcommittee on Foreign Affairs Research.)

Survey and analysis of foreign affairs research funding patterns in the U.S. Government.

Fischer, Glen H. *Public Diplomacy and the Behavioral Sciences*. Evanston, University of Indiana Press, 1972.

Use of behavioral and social research in understanding and formulating foreign policy.

"Foreign Affairs Research—FY 1974 External Research Program, Dept. of State." *FAR Horizons*. v. 7, no. 3, Summer 1974: 1–3, 14–15. (Newsletter of the Undersecretaries committee, Subcommittee on Foreign Affairs Research.)

Describes content and objectives of the research support program.

Frye, Alton. *A Responsible Congress: The Politics of National Security*. New York, McGraw-Hill (for the Council on Foreign Relations), 1975. 238 p.

"A clear and vividly written account, beginning with the 1968 debate over the ABM system, of the revival of congressional participation in setting the goals and shaping the instruments of national security. The author, a Senior Fellow of the Council on Foreign Relations and director of the Carnegie Endowment's Congress project, favors the trend toward an even more significant congressional role. On the basis of case studies and personal experience as a congressional aid, he is optimistic." (1)

Gilpin, Robert and Christopher Wright (eds.). *Scientists and National Policymaking*. New York, Columbia University Press, 1964, VIII. 408 p.

"The essays constituting this volume were prepared for the Council for Atomic Age Studies of Columbia University. Comprises: Introduction: Natural Scientists in Policymaking by Robert Gilpin, The Scientific Establishment by Don K. Price, Scientists and Politics: The Rise of an Apolitical Elite by Robert Wood, The Scientific Adviser by Harvey Brooks, Scientists and American Science Policy by Wallace S. Sayre, The President's Science Advisers and National Science Policy by Robert N. Kreidler, Scientists, Foreign Policy, and Politics by Warner R. Schilling, Strategy and the Natural Scientists by Albert Wohlstetter, The Scientific Strategists by Bernard Brodie, and Scientists and the Establishment of Science Affairs by Christopher Wright."

Halperin, Morton, et al. "The 'X' Factor in Foreign Policy. Highlights of *Bureaucratic Politics and Foreign Policy*." Brookings Research Report, 140. 1975. 9 p.

"If the proponents of rational politics toward other countries expect their recommendations be adopted, they should understand the complex process within the U.S. government, whereby agencies develop, defend, compromise, and implement policy proposals. In *Bureaucratic Politics and Foreign Policy*, Morton A. Halperin (formerly a deputy assistant secretary in the Office of the Assistant Secretary of Defense for International Security Affairs and a member of the senior staff of the National Security Council) explores with two Brookings colleagues the influence of organizational behavior on the conduct of foreign relations. Although the authors concentrate on national security affairs, they believe that most of their findings would apply equally to any governmental bureaucracy when the type of problem with which it is dealing requires a high-level decision."

Haskins, Caryl P. "Technology, Science, and American Foreign Policy." *Foreign Affairs*, January 1962: 224–243.

Mr. Haskins discusses the international science implications of the Soviet flight of Vostok II. Among his topics are the following: the international pyschological and prestige implications of application of a spectacular technology, the importance of "democratic" pluralism in scientific and technological research and development, and implications for improvement of science organization and advisory activities in the American Federal Government. He also treats the need for solidarity in Western Europe, improvement of NATO and OECD science activities, the establishment of international universities and improvements in education. Among his other topics are the need for each country to develop a policy for scientific research and development which is appropriate to the conditions of that country.

International Seminar for Diplomats. *Modern Science and the Tasks of Diplomacy*. Austria, Verlag Styria Graz Wien Koln, 1965. 238 p.

This volume contains seventeen papers presented at an International Seminar for Diplomats, held in Austria in 1965. The original versions of the papers in French, German, and English are reprinted without translations. Among the papers included are: "Medicine, Population and the New Tasks of Diplomacy," Donald Darnley Reid; "Food and Population," B. R. Sen; "The Impact of the Scientific Technology in the Development of New States," Aharon Katchalsky; "The Supply of Energy in the Future," Sigvard

Eklund; Geophysics and Its Impact on International Affairs," David A. Davies; "Mass Communication in Society," Tor Gjesdal; "Social Sciences and International Relations," John Goormaghtigh; "The Present State of Economics and the New Tasks of Diplomacy," Gottfried Haberler; and "The Development of Modern Science and the New Tasks of Diplomacy," B. H. M. Vlekke.

"International Cooperation and Foreign Aid; The United States in Technological Competition." Chapters XV and XVI, *In* Organisation for Economic Co-operation and Development. *Reviews of National Science Policy: United States.* Paris, Organisation for Economic Co-operation and Development, 1969: 546 p.

General description of organization in the United States (in both the State Department and other Federal agencies) for formulating and implementing foreign policy with scientific and technological aspects; listing of expenditures in such fields; other statistical data, and discussion of U.S. policies with respect to technology transfer and promotion of scientific and technological developments in Western European and other countries.

Killian, J. R., Jr., "Science in the State Department: A Practical Imperative." *Bulletin of the Atomic Scientists*, May 1965: 12–17.

" 'The ethos of our foreign policy should not be flawed by intellectual parochialism; our policy and outlook need not fall in the crack between the two cultures.' " "In dealing with [international] trends and needs-regional, global, and superterrestrial, our government and its foreign officers will need sophisticated, tough-minded technical advice on the feasibility of projects, on the alternatives which should be considered, on the contribution we can make to them, on their impact on our own manpower and economic resources, and on their timing and need. With this kind of judgment available, however, such large-scale programs of development and technology can multiply the helpful political choices available to us and afford us new opportunities to contribute to the welfare of the human community."

"The lecturer, Dr. James R. Killian, was addressing the U.S. Foreign Service Institute's seminar on the interaction between science and technology and foreign affairs. The . . . article is based upon the seminar lecture. . . . Dr. Killian is chairman of the MIT Corporation and was appointed by President Eisenhower as the first official science adviser to an American President."

Kissinger, Henry A. "The Global Challenge and International Cooperation." Address by the Secretary of State, Milwaukee, Wisconsin, July 14, 1975. 5 p.

". . . A candid assessment of how the U.S. Government views the contemporary United Nations—its capacities and its limitations, its promise and the trends which threaten future progress." Addresses the topics of global interdependence in economics and technology and opportunities and drawbacks of the potential for cooperation in the United Nations.

Margolis, Howard. *Technical Advice on Political Issues.* Arlington, Va., Institute for Defense Analyses, distributed by NTIS, 1972. 66 p. (AD 740–608.)

Uses three national security issues, Skybolt, SAM upgrade, and the Serpukhov computer to illustrate a general discussion of the politics of technical advice. Contrasts the receptivity to technical advice in two agencies, the National Security Council and the Department of State and argues that the State Department's apparatus for using scientific and technical information should be strengthened.

Moynihan, Michael W. "Attitudes of Americans on Coping with Interdependence: Findings of Opinion Research Organizations." A paper prepared for the National Commission on Coping with Interdependence. Interdependence Series No. 1/Aspen Institute for Humanistic Studies, Program on International Affairs. Princeton, N.J., 1975. non-paginated.

A National Commission on Coping with Interdependence was created in December 1974 by the Apsen Institute for Humanistic Studies on behalf of the State Department. One of its tasks was to assess the attitudes of the public regarding interdependence. This paper reports on the poll:

"The polls show a sharp decline in concern with international issues—as these are conventionally measured by polls. In recent years, and particularly in the past two years, people report to the pollsters that they are much more worried about domestic issues, like inflation and unemployment than about international matters. They place good relations with other countries low on the list of national priorities. There is other evidence; some specific, e.g., mounting opposition to military aid. We believe, and many of the experts agree, that these findings do not mean that the public is no longer concerned with international issues but is quite sensibly giving its limited attention to matters of immediate importance. Moreover, attitudes toward energy and food sharing, trade and foreign economic assistance are not negative when the fairness factor is taken into account."

National Academy of Sciences. *Report of the Foreign Secretary, 1974.* Washington, National Academy of Sciences, 1974. 50 p.

Final report of Harrison Brown, foreign secretary until 1974, on the activities of his office. Describes: the Commission on International Relations; Board on International Scientific Exchanges; Board on International Organizations and Programs; Board on Science and Technology for Development; relations with other academies; activities of the Office of the Foreign Secretary, National Academy of Engineering; sources of support; members of committees; professional staff; and list of publications, 1963 to date.

Platig, E. Raymond. "Research and Analysis." *In* Resources and Needs of American Diplomacy. Special issue of *The Annals of the American Academy of Political and Social Science.* Ed. by Smith Simpson, v. 380, November 1968: 50–59.

"Our ability successfully to look forward in the conduct of our foreign relations rests, in large part, upon how we develop and use our resources for research and analysis. At present, these are broadly diffused in both the public and private sectors; a number of stresses and strains indicate that they are not as effectively deployed and utilized as they could be. Improvements are possible on many fronts. Attention here is on the information, research, and analysis needs of the U.S. Government, with particular attention to the Department of State. The Department's Bureau of Intelligence and Research (INR) occupies a pivotal position. A substantial increase in its capabilities would have many desirable consequences. Among these are: enrichment of INR's own influential analytical research efforts; stimulation and support of the academic search for more coherent and socially relevant knowledge; assurance that the Department will derive the maximum analytical benefit from a modern information handling system; expanded opportunities to train Foreign Service officers in analytical methods; more balanced and efficacious programs of Government contract and grant support for foreign affairs research; and more systematic policy review and development in support of planning."

Pollack, Herman. "Interaction of Science and Technology and Foreign Affairs." Statement by Herman Pollack, Acting Director, International Scientific and Technological Affairs, made before the Subcommittee on Science, Research, and Development of the House Committee on Science and Astronautics, April 19, 1966. *Department of State Bulletin,* June 13, 1966, p. 946–948.

This article is a reprint of a statement made by Herman Pollack, Acting Director, International Scientific and Technological Affairs, Department of State, in support of a bill to amend the charter of the National Science Foundation to give the agency a more active role in support of international scientific activities. In explaining his support for this proposal Mr. Pollack discussed potential international political benefits resulting from an increase in U.S. international scientific activities. He elaborated upon the need for interdisciplinary research to meet today's problems and discussed NSF support of directing appropriate people to the Department of State's international science office and State's seminar training programs for diplomats involved in international science affairs.

The Potential Impact of Science and Technology on Future U.S. Foreign Policy. Papers Presented at a Joint Meeting of the Policy Planning Council, Department of State, and a Special Panel of the committee on Science and Public policy, National Academy of Sciences. June 16–17, 1968, at Washington, D.C. 1968. 171 p.

Series of policy planning problem papers (with references) presented by industrialists, academicians, officials of the Federal Government and members of the National Academy of Sciences. Papers include: "Growth of World Population—U.S. Policy;" "United States Public Policy with Regard to World Food Problems;" "Approach to Assessment of the World's Mineral Resources;" "Mineral Resources Form the Emerged Lands;" "Information Technology and U.S. Foreign Relations in the Next Decade," "Current Development in the Atmospheric Sciences and Some of Their Implications for Foreign Policy;" "The Oceans Fifteen and Fifty Years from Now;" "Some International Aspects of Water Resource Development;" "Pollution of the Environment;" and "The Rural to Urban Population Shift—A Global Problem."

Primack, Joel and Frank von Hippel. *Advice and Dissent: Scientists in the Political Arena.* New York, Basic Books, 1974. 299 p.

"Citing the supersonic transport, the ABM, pesticides, and other examples, two scientists argue that 'concerned citizens' should be skeptical of government use of scientific advice unless the data are made available for independent verification; 'concerned scientists' should not rest with writing advisory reports for Washington but should carry their message to the public."(1)

"Science and Technology in Presidential Policymaking: Role in Foreign Policy." *Science and Technology in Presidential Policymaking: a Proposal.* Report of the Ad Hoc Committee on Science and Technology, National Academy of Sciences. Washington, D.C., June 1974. *In* U.S. Congress. House, Committee on Science and Technology, Federal Policy, Plans, and Organization for Science and Technology. Part II. Hearings, 93rd Cong., 2d sess., June and July 1974. Washington, U.S. Govt. Print. Off., 1974: 489–492.

"Science and the Foreign Service." *Department of State News Letter*, June 1968: 10–12.

This article contains two views of the State Department's Scientific and Technological Exchange Program, begun in 1966. One article, by Thomas Wilson, described his participation as a State Department official in the Cooperative Project Division of the Office of International Affairs, National Aeronautics and Space Administration. The other article, by Thomas G. Gabbert, describes his duty as an official of the Atomic Energy Commission with the Office of Atomic Energy Affairs in the office of International Scientific and Technological Affairs, Department of State. Both individuals had similar observations about the program. In the words of Mr. Wilson: "This brief . . . description gives an idea of the fluidity of the U.S. national science policy situation and the consequent opportunities for suggesting and vesting new ideas and policies. State's role touches each where international activities are involved, and . . . it is clear why we need more men and women equipped to respond effectively to this challenge to our contemporary international relations."

"Science, Technology, and the Policy Process." *In* U.S. Congress. Senate. Committee on Government Operations. *Organizing for National Security.* Hearings before the Subcommittee on National Policy Machinery. v. I. Washington, U.S. Gov. Print. Off., 1961, p. 237–411.

Part 2 this volume of the Jackson Subcommittee hearings treats the impact of science and technology on foreign and defense policymaking. Policies and programs of the Departments of State and Defense, as well as other facets of science policy are considered. Witnesses for this session of the hearings included: Dr. James A. Perkins, Vice President of the Carnegie Corporation; Dr. James B. Fisk, President, Bell Telephone Laboratories, and Vice Chairman, The President's Science Advisory Committee; William H. Pickering, Director, Jet Propulsion Laboratory, California Institute of Technology; Dr. Eugene P. Wigner, Professor of Mathematical Physics, Princeton University; Edward M. Purcell, Professor of Physics, Harvard University; and Dr. Herbert F. York, Director of Defense Research and Engineering, Department of Defense.

Seitz, Frederick and Rodney W. Nichols. *Research and Development and the Prospects for International Security.* New York, Crane, Russak and Co., 1974, 74 p.

The authors "begin from the premise that American technological supremacy which had developed throughout the post-war world has eroded, and that our decision makers must consequently select options in weaponry and basic research under constraints of scarcity. They are attempting to alter a climate of opinion within both Congress and the Department of Defense, which, they contend, has been hostile to Research and Development projects not specifically linked to operational missions. Investment in 'full-scale prototyping' (including testing and evaluational stages), which is costly, would produce long term economies by eliminating gross cost overruns and outright failures. The authors regard the sector of R and D, if expanded beyond specific missions, as an enduring realm of Western superiority, presumably because the very existence of a vigorous extra governmental scientific community is both more innovative and more critical, thus more robust. . . . In brief, Seitz and

Nichols argue for: (1) a broadening of defense-relevant thinking to include 'civilian' science, (2) a budgetary commitment to R and D on this expanded base; and (3) a more extended use of prototyping to evaluate operational alternatives." (4)

Skolnikoff, E. G. "History of U.S. Government Organization for Conduct of Foreign Policy in Technology-Related Subjects." Prepared for the Commission on the Organization of Government for the Conduct of Foreign Policy. Typescript, March 16, 1975. 38 p.

The author deals generally with the following issue: "The general lesson from postwar history in the conduct of foreign policy in technology-related issues is the great difficulty the Department of State has in exerting anything like a primary role. The technical, operating agencies of government tend to have the initiative in determining policy in their areas of interest, with State able to exert its presence usually only at the point at which issues become specific and current. Even then, the momentum of earlier decisions, the greater technical knowledge and the mobilizable resources of the operating agencies, has meant that State has relatively little independent leverage except in those issues for which it is able to mount a special and unusual effort. With regard to the direction of technological development itself, which will shape the future, the Department of State has essentially no role at all."

Several concluding observations are given about ways to increase State's role in formulating foreign policy that deals with technology. Among these are the following: better leadership for the science and technology office in the Department of State; more interaction between this office, the science office and other offices in the Department and more and better technical support; reestablishment of a White House science office, which uses the resources of the Department of State's science and technology office in developing policy advice; generally more and more-informed congressional interest in these topics; and the need for better information and analysis capabilities in government.

Skolnikoff, Eugene B. *The International Imperatives of Technology: Technological Development and the International Political System.* Berkeley, Institute of International Studies, University of California [c 1972]: 104 p.

Elaborates on the theme of the inevitable interdependence of the nations of the world and the need for international responses to deal with the impacts of science and technology on sovereign nation-states.

Skolnikoff, Eugene B. *Science, Technology, and American Foreign Policy.* Cambridge, The MIT Press, 1967. 316 p. plus index.

Written by former assistant to three Presidential Special Assistants for Science and Technology (Killian, Kistiakowsky, and Wiesner) who is with the MIT science and public policy program. Reviews the relationships of science to many different aspects of foreign affairs and evaluates policy machinery to formulate and administer foreign policies with a science content. Recommends strengthening of foreign policy organization and personnel, and greater analysis by the government and university researchers of the scientific and technological vectors of foreign policy. Regarded as a basic study on the subject.

Skolnikoff, Eugene B. and Harvey Brooks. "Science Advice in the White House? Continuation of a Debate." *Science,* v. 187, no. 4171, Jan. 10, 1975, p. 35.

The international dimension is treated.

"Strengthening the Department of State." *Department of State Newsletter,* July 1975: 2–5.

"On June 27, Secretary [of State, Henry] Kissinger welcomed the 119th Foreign Service Officer Class. In his remarks, he announced the formation of a new Priorities Policy Group to link decisions on resource allocation to the broader considerations of foreign policy. He also announced several changes in personnel policy to improve the recruitment, evaluation, assignment, and career development of the Department's professional service." This article contains his remarks.

U.S. Comptroller General. *The Agricultural Attache Role Overseas: What He Does and How He Can Be More Effective for the United States.* Report to the Congress. April 11, 1975. Washington, U.S. Govt. Print. Off., 1975. 93 p. (ID–75–40.)

"GAO's review of agricultural attaches was prompted by the interest generated in their activities resulting from the unexpected volume of Soviet wheat purchases in 1972, the growing concern over the adequacy of information on world food supplies and demands, and the Secretary of Agriculture's emphasis on attaches as 'salesmen.' The review included attache posts in South America, Western and Eastern Europe, the Far East, and Australia, as well as U.S. Missions to the Food and Agricultural Organization . . . and the European Community . . . ." The report recommends to the Congress how the Dept. of Agriculture can and should make improvements to increase the effectiveness of its foreign agricultural attaches. These include improvements in management and the direction of attache activities; better coordination of training for attaches; better information-gathering systems; more effective use of promotional resources; and the collection of more and better information regarding agriculture in the Soviet Union and the Eastern bloc countries.

U.S. Comptroller General. *Commercial Offices Abroad Need Substantial Improvements To Assist U.S. Export Objectives.* Report to the Congress, Oct. 24, 1972. Washington, U.S. Govt. Print. Off., 1972. 51 p. (B-172255.)

"This report examines the effectiveness of U.S. commercial offices maintained in other countries to assist American businesses to increase their export sales." Among the recommendations made to the Secretaries of State and Commerce regarding the offices were the following: to (1) "formulate long-range export expansion plans with specific goals and strategies, for individual countries or major market areas; establish priorities for accomplishing the many commercial programs and services, implement a system of reporting and evaluating program results, and strengthen procedures for recruiting, assigning and training commercial officers to obtain better qualified commercial staffs and consider upgrading the commercial office staffs."

U.S. Congress. House. Committee on Foreign Affairs. *The Overseas Private Investment Corporation: A Critical Analysis.* Prepared by the Foreign Affairs Division, Congressional Research Service, Library of Congress. Sept. 4, 1973. 93d Cong., 1st sess. Washington, U.S. Govt. Print. Off. 1973. 105 p. (Committee print.)

The principal instrumentality by which the U.S. Government seeks to stimulate private investment in the developing countries is the Overseas Private Investment Corporation (OPIC). This study analyzes the policies, directions, and effects of OPIC. The first two chapters consider OPIC's history, organization, and programs. The third chapter compares OPIC with similar programs in other countries and with other insurance and finance programs in the U.S. Government. The fourth chapter analyzes OPIC's current operations. Subsequent chapters discuss OPIC's financial status, its role in balance-of-payments problems, and its impact on foreign relations.

U.S. Congress. House. Committee on International Relations. *Congress and Foreign Policy: 1974.* Prepared by the Foreign Affairs Division, Congressional Research Service, Library of Congress. April 15, 1975. 94th Cong., 1st sess. Washington, U.S. Govt. Print. Off., 1975. 72 p. (Committee print.)

This report describes congressional activities in 16 functional and geographic areas and highlights of significant events of congressional activities relating to foreign policy during 1974. The topics covered are: the State Department and related agencies; foreign assistance; international trade and international economic policy; arms control and disarmament; the defense budget; intelligence; international organizations and law; oceans, seabed, and fisheries; international social issues; the Middle East; Asia; Latin America; Africa; Western Europe; Soviet Union and Eastern Europe; and other aspects.

U.S. Congress. House. Committee on Science and Astronautics. *International Science Policy.* Washington, U.S. Govt. Print. Off., 1971, 1[illegible] p.

A compilation of papers prepared for the 12th meeting of the Panel on Science and Technology 1971. Statements by Federal officials, foreign officials, and leading statesmen and scholars to define how science and technology can be utilized in solving critical national and international problems.

U.S. Congress. House. Committee on Science and Astronautics. *Coordination of Foreign Scientific Policy.* Staff Study Prepared for the . . . [by Spencer M. Beresford.] November 9, 1962, Committee Print. 87th Cong., 2d sess. Washington, U.S. Govt. Print. Off., 1963. 6 p.

A review of the history and work of the principal coordinating mechanisms of the U.S. Government in dealing with international science activity and policy—the scientific attachés and the Office of International Scientific Affairs (SCI), in the Department of State.

Recommends that the House Committee on Science and Astronautics periodically review the coordination of national science policy with respect to: effectiveness, adequacy, cost, impact of science on foreign affairs, and international scientific and technological cooperation.

U.S. Congress. House. Committee on Science and Astronautics. *Panel on Science and Technology: Eighth Meeting; Government, Science, and International Policy.* Proceedings. January 24, 25, and 26, 1967. [No. 1.] 90th Cong., 1st sess. Washington, U.S. Govt. Print. Off., 1967. 220 p.

Designed to provide the committee with background information, this set of hearings and seminars includes statements about the impact of developments in science on political, economic and social development abroad, as well as statements about the objectives, formulation, and administration of U.S. international science policies. Some of the witnesses before the committee were: Hon. Dean Rusk, Secretary of State; Dr. Philip Handler, Chairman, National Science Board; Mr. Robert Major, director, Royal Norweigan Council for Scientific and Industrial Research; Dr. Kankuro Kaneshige, member, Council for Science and Technology, Japan; Dr. Harrison S. Brown, foreign secretary, National Academy of Sciences; Dr. Donald F. Hornig, Director, Office of Science and Technology; Dr. C. Chagas, president, Brazilian Academy of Sciences; Dr. Frank J. Malina, Trustee-Past President, International Academy of Astronautics, and Dr. Fred L. Whipple, director, Smithsonian Astrophysical Observatory.

U.S. Congress. House. Committee on Science and Astronautics. *Panel on Science and Technology: Ninth Meeting: Applied Science and World Economy.* Proceedings before the . . . January 23, 24, and 25, 1968. [No. 1.] 90th Cong., 2d sess. Washington, U.S. Govt. Print. Off., 1968. 275 p.

Hearings and papers presented at the ninth annual meeting of the university-government-industry Panel on Science and Technology, convened to provide the House Committee on Science and Astronautics with the thoughts and problems of the scientific community. Papers presented include a wealth of background information on substantive and policy problems facing those concerned with international scientific, technological and economic development. Principal discussion topics include: utilization of technological resources for human welfare; geographic distribution of technical resources, market mechanisms in the application of technology, and coupling technology to the economy. Guest panelists were: Barbara Ward, Dr. Antonie T. Knoppers, Dr. Walter J. Hesse, Dr. O. M. Solandt, Dr. Jorge A. Sabato, Dr. Alexander King, Mr. Martin Goland, and Dr. Roger Revelle.

U.S. Congress. House. Committee on Science and Astronautics. *The Participation of Federal Agencies in International Scientific Programs.* Report of the Science Policy Research and Foreign Affairs Divisions, Legislative Reference Service, Library of Congress, to the Subcommittee on Science, Research and Development. 90th Cong., 1st sess. Washington, U.S. Govt. Print. Off., 1967. 167 p. Charts and Tables. (Committee Print)

Highlights the nature and scope of the involvement of Federal agencies in international scientific activities. Described are the activities of: National Academy of Sciences-National Research Council; International Committee of the Federal Council for Science and Technology; Department of State; relationships with international organizations; National Science Foundation: Department of Agriculture; Atomic Energy Commission; Department of Commerce; Department of Defense; Department of Health, Education and Welfare; Department of the Interior; and National Aeronautics and Space Administration.

U.S. Congress. Senate. Committee on Foreign Relations. *Prohibition of Chemical and Biological Weapons.* Hearings on Ex. J. 91–2 and Ex. Q, 92–2 and S. Res. 48, Dec. 10, 1974. Washington, U.S. Govt. Print. Off., 1974. 71 p.

U.S. Congress. Senate. Committee on Foreign Relations. *United States Foreign Policy.* Hearings before the . . . on Possible Nonmilitary Scientific Developments and Their Potential Impact on Foreign Policy Problems of the United States; Worldwide and Domestic Economic Problems and Their Impact on the Foreign Policy of the United States; and United States Foreign Policy—Africa." (Studies Prepared Pursuant to S. Res. 336, 85th Cong., and S. Res. 31, 86th Cong.) January 28, February 11, and March 16, 1960. Part I. 86th Congress, 2d sess. Washington, U.S. Govt. Print. Off., 1960. 237 p.

Included on pages 1–50 is the hearing on "Scientific Developments and Their Impact on Foreign Affairs." The hearing was held as a follow-up to the committee's receipt of the Stanford Research Institute (SRI), study, "Possible Nonmilitary Scientific Developments and Their Potential Impact on Foreign Policy Problems of the United States." The impact of developments in the physical, natural and social sciences as well as the current State

Department program in science and foreign relations are items discussed by E. Finley Carter, President, Stanford Research Institute, and Wallace R. Brode, Science Adviser, Department of State. Mr. Brode also replied to some of the criticisms made of the State Department's program in the SRI report.

U.S. Department of State. *Science, Technology and Foreign Affairs. Report on the Seminar held at the Foreign Service Institute, January 11 to February 5, 1965.* Prepared by L. F. Audrieth, Visiting Professor of Science Affairs at the Foreign Service Institute, and H. I. Chinn, Science Officer, International Scientific and Technological Affairs, Department of State. Washington. U.S. Government Printing Office, 1965. 109 p.

This volume comprises the report of the Foreign Service Institute's first seminar in "Science, Technology and Foreign Affairs," an effort to explore, with foreign service officers and other governmental officials, how science and technology contribute to the development and execution of U.S. foreign policy. Included in the volume are course outline, selected bibliographies, copies of addresses presented and a resume and evaluation of the seminar. Recommendations treating subsequent seminars are also included.

U.S. Department of State. Bureau of International Scientific and Technological Affairs. *International Science Notes*, no. 31, January 1974.

Contains the following articles: Outline of science and technology at the State Department: 2–3; Western Europe's spacelab and the U.S. shuttle: 3–4; International scientific and technological conference on narcotics and dangerous drugs: 4–5; C.C.M.S. holds an environmental roundtable: 5–8; German science/technology policy and the 1974 budget: 8–10; The Weizmann Institute of Science: 10–11; and Geothermal energy and foreign affairs: 11–14.

U.S. Department of State. Bureau of International Scientific and Technological Affairs. *International Science Notes*, no. 32, July 1974.

Contains the following articles: Tangible benefits of international scientific exchange: the Yugoslav example: 2–3; Instances of the United States/Poland scientific research program: 3–4; P.L. 480 funding for scientific programs by agency and country: 4; The acceleration of international scientific activity: 4–7; Public seminar on global food production: 7–9; Canada-France-Hawaii telescope: 9–10: and Science and the State Department in 1973: 10–16.

U.S. Department of State. Bureau of Oceans and International Environmental and Scientific Affairs, *International Science Notes*, no. 33, January 1975.

Contains the following articles: The New Bureau: 2–3; Man and the biosphere programme and its September meeting, 3–6; Foreign energy scholars program: 6–7; The International Institute for Applied Systems Analysis: 7–10; Recent 'Environment' Conventions: Status and prospects: 10–12; and U.S. scientific and technological relationships with other nations: 12–14.

U.S. Department of State. Bureau of Oceans and International Environmental and Scientific Affairs. *International Science Notes*, no. 34, June 1975.

Contains the following articles: A world conference for third world development: 2–5; Notes on technology transfer to LDC's and the U.S. Government's role: 5–10; A compendium of U.S.-Japan scientific and technological cooperation: 10–13; and A review of science and technology in Israel and its relation to the U.S.: 13–15.

U.S. Dept. of State. Bureau of International Scientific and Technological Affairs. *International Scientific Cooperation—a Summary of Tangible Benefits.* [Washington, 1974]. 12 p. (U.S. Dept. of State. General foreign policy series, 285.)

"All of the technical agencies of the government have contributed examples of how improvements in our economy or quality of life have resulted from international cooperation. This report is a summary of some of these examples. It serves as a reminder that international cooperation can be justified in terms both tangible and intangible."

U.S. Federal Council for Science and Technology. *International Scientific and Technological Activities.* A report to the Federal Council for Science and Technology by its International Committee, June 20, 1961. For Authorized Committee Use. Mimeo, 1961. 25 p.

President Eisenhower's science adviser requested that the "International Committee of the [Federal Council for Science and Technology] 'undertake to review the international scientific activities of the agencies represented thereon' in accordance with . . . action of the National Security Council." This report forms one part of that review; separate task forces studied specific phases of the problem; their reviews are available separately.

Among the recommendations made are the following: the need for "clarity in our objectives and in the arrangements for attaining them; adequate coordination amongst government agencies and with nongovernmental groups; acceleration of many activities; initiation of new undertakings to fill gaps; and a coordinated series of guidelines for international activities." Also recommended was improvement of mechanisms for formulating and administering foreign policy with international scientific and technological components. This would require: "better information on what we are doing; foreign policy evaluation; operational evaluation; integration of U.S. scientific missions overseas with other foreign policy missions; understanding of the role of science and technology in technical assistance; an international role for NSF; [and] greater assistance from the Federal Council for Science and Technology and its International Committee."

U.S. Library of Congress. Congressional Research Service. Foreign Affairs Division. Collier, Ellen and Martha Hutchinson. *The Role of Advisory Committees in U.S. Foreign Policy*. Apr. 1975. 135 p.

Issued as a joint committee print, Senate Committee on Foreign Relations and House Committee on International Relations, 94th Cong., 1st sess.

U.S. National Science Foundation. *Justification of Estimates of Appropriations, Salaries and Expenses, and Special Foreign Currency Program, Fiscal Year 1976 to the Congress*. Washington, National Science Foundation, 1975, various parts.

International or foreign science and technology activities, including statements on recent awards and forthcoming plans for support are included in the following sections: International Cooperative Science Activities ($8 million requested for: cooperative science programs, scientific organizations and resources program, international travel, and support for special foreign currency projects); Science Advisory Activities Summary ($4 million requested, including funds for research on technology transfer with Latin America, assessment of the U.S.-U.S.S.R. scientific and technological agreements, international affairs, the role of international technology transfer in world trade and implications for U.S. policies, scientific and technical policy options from a national perspective in response to the emerging number of new international multilateral and bilateral relationships, and the role of U.S. science and technology *vis-á-vis* the Soviet Union); and the Special Foreign Currency Program ($4 million requested for scientific research and information exchange.)

Wohlstetter, Albert. "Scientists, Seers and Strategy." *Foreign Affairs*, v. 41, no. 3, April 1963: 466–78.

"This article is based on a longer monograph bearing the same title, presented at a conference of the Council of Atomic Age Studies at Columbia University . . . ." Mr. Wohlstetter discusses the merits of the political and "scientific" adviser role displayed by scientists in decisions on national and international security questions. He concludes: "Both the physical and the behavioral sciences have a role to play in component research on cardinal choices. And in the course of studying strategic alternatives the methods of science can be used to reach conclusions going beyond the skills of any of the individuals involved. The important point is that on these complex cardinal questions, answers are won precariously and intermittently, in the course of hard empirical inquiry into the major factors affecting choice. Intuition and intelligence help, but do not make superfluous the study not only of the vital technologies, but also of the behavior of men and nations using, and affected by the use of, such technologies. No one has the gift of reliable foresight on these cardinal choices. The primary thing, then, is *not* to be positive. The basic failure of the physical scientists and engineers in their turbulent history during the cold war is not their lack of prescience but their acting frequently as if they had it."

FORMULATION OF POLICIES DEALING WITH SCIENCE AND TECHNOLOGY: REGIONAL AND INTERNATIONAL ORGANIZATIONS

Atlantic Council of the United States. Special Committee on Intergovernmental Organization and Reorganization. *Beyond Diplomacy.* [Washington, 1975] 87 p.

". . . A study of the adequacy of present intergovernmental organizations relevant to the relations of the Atlantic nations and to their relationship with the other nations of our common globe. The objective of the study is to devise measures to improve the structure and functioning of existing organizations, or to recommend new ones if necessary, to deal with certain key contemporary problems of a transnational nature, and some that are emerging over the horizon."

Brown, David. "New Supranational Institutions." *Futurist,* v. 6, Oct. 1972: 197–202.

"The problems that man faces today are increasingly global in scope, but the institutions to cope with them remain national. The author describes some new institutions that could enable the world to deal more effectively with its problems."

Cox, Robert W., Harold K. Jacobson, Gerard and Victoria Curzon, Joseph S. Nye, Lawrence Scheinman, James R. Sewell, and Susan Strange. *The Anatomy of Influence: Decision-making in International Organization.* New Haven, Yale University Press, 1973. 497 p.

A sophisticated analysis of power and influence in international organizations, including in the science and technology area: UNESCO, WHO, and IAEA. The authors note the importance of nationalism as opposed to functionalist internationalism as a source of power and influence even in the predominant bulk of issues studied by the organizations, which are geared to assisting the developing countries.

"Europeans Set up a (Shaky) Science Foundation." *Science and Government Report,* October 15, 1973: 7–8.

Describes evolution of activities to set up a science foundation under the Common Market structure.

Gardner, Richard N. "To Make the World Safe for Interdependence." *The Inter-Dependent,"* July-August 1975: 14–18, 143–145.

A candid review of the failures and accomplishments of the United Nations and other associated international organizations in promoting a harmonious economic, social, and technological interdependence among nations.

Goodrich, Leland M. *The United Nations in a Changing World.* New York, Columbia University Press, 1974. 280 p.

"Professor Goodrich presents an optimistic assessment of the United Nations through the examination of several issue-areas, i.e., peacekeeping, protection of human rights, etc. He foresees an expanded role for it because of developments in economics and technology." (1)

Goodrich, Leland M. and David A. Kay, eds. *International Organization: Politics and Process.* University of Wisconsin Press, 1973.

Haas, Michael. *International Organization: an Interdisciplinary Bibliography.* (Bibliographical Ser., No. 41.) Stanford, Hoover Institute Press, 1974.

Jordan, Robert S., ed. *Multinational Cooperation: Economic, Social and Scientific Development.* Oxford, Oxford University Press, 1972. 392 p.

"This volume attempts to explain how multinational organizations operate. It is a collection of eight original essays which examine multinational activities directed toward economic, social, and scientific concerns. Each of the first seven essays discusses a specific area of multinational activity, including such topics as international administration of space exploration, uses of the oceans, the International Monetary Fund and developing countries, and a study of UNESCO. The last essay looks at international administration from a behavioral science viewpoint."

Keohane, Robert O., ed. and Joseph S. Nye, Jr. "Transnational Relations and World Politics." *International Organization*, v. 25, summer 1971: whole issue.

Partial contents.—The growth of international nongovernmental organization in the twentieth century.—The multinational business enterprise: what kind of international organization?—Transnational networks in basic science.—National autonomy and economic development: critical perspectives on multinational corporations in poor countries.—Transnational relations as a threat to the democratic process.

Later published as a book.

Killian, J. R., Jr. "An International Institute of Science and Technology." *In* Norman Kaplan, ed. *Science and Society*. Chicago, Rand McNally & Co., 1965. p. 510–518.

Authored by the Chairman of the Corporation of the Massachusetts Institute of Technology and first Special Assistant on Science and Technology appointed by President Eisenhower in 1957, Dr. Killian "outlines some of the major reasons for considering the establishment of an international institute of science and technology." Among the issues he raises in connection with the proposed institute are: "the possibility of having such an institute grant a degree which would be international in status and be recognized by the member nations; the explicit combination of science and technology; the concentration on doctoral and postdoctoral students; the combination of the research institute idea with the idea of a center for advanced studies; and finally, the breaking down of traditional university departmental patterns of organization."

Macioti, Manfredo. "Science and Technology in the Common Market: A Progress Report." *Research Policy*, v. 4, 1975: 290–310.

"This paper deals with science, technology and Europe. It purports to show that the European Community (the Common Market of Nine European Countries) has been quite successful in promoting trade, economic growth and industrial competition, interpenetration and specialisation. However, since a large, prosperous, unified market was created in Europe in the late Sixties, a host of new problems has surfaced. These mainly concern the quality of Man's life, the relations between Man and Society, the balance between Man and Nature. These new problems cannot be solved by the invisible hand of the market, but require public intervention, common policies. Here the record of Europe is rather more doubtful, although common solutions to crucial issues such as energy, pollution and science and technology have been under discussion within the Community for a number of years. On the other hand, joint decisions taken in 1973 on the protection of the environment, the setting-up in early 1974 of joint machinery (CREST) for helping to define a common policy in science and technology, first steps toward the creation of a common capacity for long-range forecasting and assessment, as well as the establishment of a European Science Foundation in 1974 and recent moves toward a common energy policy, give some hope for the future of European integration in science and technology."

The author is the director of science policy of the Commission of the European Communities in Brussels.

McLin, Jon. *International Institutions for "Planetary Bargaining."* [Hanover, N.H., American Universities Field Staff, 1975] 10 p. (American Universities Field Staff. Fieldstaff reports. West Europe series, v. 10, no. 1 [General])

"The Aspen Institute of Humanistic Studies, meeting in Berlin in February, sought a practical basis for the reform of existing, and the creation of new, international institutions to conceive and implement a collection of parallel 'bargains' on such matters as food, population, energy, investment, and security."

Organization of American States. Department of Scientific Affairs. Regional Scientific and Technological Development Program Newsletter, quarterly.

Short articles describe cooperative and national activities, legislation, and research to develop science and technology in OAS states; also discusses technology transfer.

Organization of American States. Secretary General. *Ciencia Interamericana.* Published quarterly by OAS, Washington, D.C.

Contains detailed articles on scientific and technological developments and cooperation, as well as important national regulations on cooperation and science among the OAS member states.

Raiffa, Howard. "A Multinational Institute Explores Global Problems." *Futurist*, v. 9, June 1975: 147–149.

The director of the International Institute for Applied Systems Analysis describes the foundation and purpose of the Vienna based research organization. The institute is a nongovernmental multi-disciplinary unit formed to examine global problems.

Ruggie, John Gerard and Ernest B. Haas, eds. "International Responses to Technology." *International Organization*, v. 29, no. 3, Summer 1975.

Special issue which contains articles on the general topic of technology and the international political system. The articles included are: "International Responses to Technology: Concepts and Trends," John Gerard Ruggie; "International Safeguarding as Institutionalized Collective Behavior," Robert Pendley, et al.; "Collective Responses to R and D Problems in Western Europe: 1955–1958 and 1968–1973," Henry R. Nau; "INTELSAT: Technology, Politics and the Transformation of a Regime," Steven A. Levy; "In Search of an Ocean Regime: The Negotiations in the General Assembly's Seabed Committee 1968–1970," John L. Lovald; "Collective Arrangements for Managing Ocean Fisheries," Charles B. Heck; "Technocrats and the Management of International Fisheries," Barbara Johnson; "The Intergovernmental Oceanographic Commission and the Stockholm Conference: A Case of Institutional Non-Adaption," Michael Brenner; "International Responses to Weather Modification," Edith B. Weiss; "Is There a Hole in the Whole: Knowledge, Technology, Interdependence and the Construction of International Regimes," Ernest B. Haas; "Toward Mutual Accountability in the Nonterrestrial Realms," Seyom Brown and Larry L. Fabian; "The Cocoyoc Declaration;" and "Bibliographical Note."

Science and Technology in an Era of Interdependence. A report of a National Policy Panel established by the United Nations Association of the United States of America. New York, United Nations Association of the United States of America, 1975. 85 p.

The panel of noted statesmen and scholars offers several major recommendations to enhance the ability of international organizations to deal with advances in science and technology.

U.S. Congress. House. Committee on Banking, Currency and Housing. Subcommittee on International Development Institutions and Finance. *U.S. Participation in Multilateral Development Lending Institutions.* Hearing, 94th Cong., 1st sess. July 8, 1975. Washington, U.S. Govt. Print. Off., 1975. 286 p.

International agencies/Government lending—[U.S.]—Law and legislation/American economic assistance—Law and legislation/Development credit institutions/Foreign loans—[Developing countries]/ Economic assistance—Statistics.

U.S. Congress. House. Committee on International Relations. Subcommittee on International Organizations. *United States Policy on Review of the United Nations Charter.* Hearing, 94th Cong., 1st sess., on H. Con. Res. 206. July 17, 1975. Washington, U.S. Govt. Print. Off., 1975. 63 p.

Foreign relations—[United Nations]—U.S./Foreign relations—[U.S.]—United Nations/Treaties—[U.S.]/International agencies/United Nations. Charter.

U.S. General Accounting Office. *Numerous Improvements Still Needed in Managing U.S. Participation in International Organizations, Department of State and Other Agencies.* Report to the Congress by the Comptroller General of the United States. [Washington] 1974. 50 p. "B-168767, July 18, 1974."

United Nations. Economic Commission for Europe. *Analytical Report on Industrial Co-operation Among ECE Countries.* Geneva, United Nations, 1973, 117 p. (United Nations. (Document) E/CEC/844/Rev. 1)

Analysis of the factors that have contributed to the growth of industrial cooperation among the ECE countries. The report includes descriptions of the various types of industrial cooperation and a discussion of problems and prospects for future development. Particular attention is devoted to industrial cooperation between East and West European countries.

United Nations. Educational, Scientific and Cultural Organization. [*Science Policy Studies and Documents.*] [Paris, UNESCO.]

Publications relevant to this bibliography include: La politique scientifique et l'organisation de la recherche scientifique en Belgique [1965, No. 1]: Science policy and organization of scientific research in the Czechoslovak Socialist Republic [1965, No. 2]; National science policies in countries of South and South-East Asia [1965, No. 3]; Science policy and organization of research in Norway [1966, No. 4]; Science policy and organization of research in the USSR [1967, No. 7]; Science policy and organization of scientific research in Japan [1968, No. 8]; Science policy and the organization of scientific research in the Socialist Federal Republic of Yugoslavia [1968, No. 9]; National science policies of the U.S.A. Origins, development and present status [1968, No. 10]; The promotion of scientific activity in tropical Africa [1969, No. 11]; Science policy and organization of research in the Federal Republic of Germany [1969, No. 12]; Bilateral institutional links in science and technology [1969, No. 13]; La politica cientifica en America Latina [1969, No. 14]; National science policies in Europe [1970, No. 17]; National science policy and organization of research in Israel [1970, No. 19]; Politica cientifica y organizacion de la investigacion cientifica en la Argentina [1970, No. 20]; National science policy and organization of research in Poland [1970, No. 21]; National science policy and organization of research in the Philippines [1970, No. 22]; La politique scientifique et l'organisation de la recherche en France [1971, No. 24]; Science policy and the European States [1971, No. 25]; National science policy and organization of scientific research in India [1972, No. 27]; La politica cientifica en America Latina-2 [1972, No. 29]; European scientific co-operation: priorities and perspectives [1972, No. 30]; and National science policies in Africa [1974, No. 31.]

Weisband, Edward and Thomas M. Franck. "A Rationale for International Technology Assessment: Towards an Ethical Science." New York, New York University, Center for International Studies, c1971. 40 p. (New York University. Center for International Studies. Policy papers, v. 4, no. 4)

Discusses the need for technology assessment on an international scale, and makes suggestions for realization of this goal.

SCIENCE AND TECHNOLOGY IN NATO AND OECD

"AT OECD: Meeting of the Committee for Scientific and Technological Policy." *OECD Observer*, October 1972 : 40–41.

Describes activities relating to research and development statistics; research and development in the service sector; development and utilization of the social sciences; completion of studies on "research systems," organization of information, computer, and communications systems: stimulation of innovation in private and public sectors; technology assessment; international cooperation in R and D; and science and technology for developing countries."

Blaney, Harry C. "NATO's New Challenges to the Problems of Modern Society." *Atlantic Community Quarterly*, v. 11, summer 1973: 236–247.

Assesses the work and potentialities of NATO's Committee on the Challenges of Modern Society which attempts to deal with problems that plague modern society such as environmental purity.

"CCMS Plenary Session Inaugurates Three New Pilot Studies." *NATO Review*, v. 21, 1973: 16–18.

The Committee on the Challenges of Modern Society (CCMS) inaugurated 3 pilot studies in 1973 on disposal of hazardous substances, solar energy and geothermal energy.

Davignon, Etienne. "The New International Energy Agency of OECD." *OECD Observer*, no. 73, Jan.–Feb. 1975: 20–25.

"OECD's International Energy Agency, set up on 15th November, will carry out a comprehensive programme of co-operation—both in the event of emergency and over the longer term—among 16 oil consumer countries belonging to OECD."

Doran, Charles F. "Can NATO Defend the Environment?" *Environmental Affairs*, v. 2, spring 1973: 667–684.

"Which perspective is the valid one—the view on the one hand that NATO can supply a credible defense of clean air and water and a higher quality of life, or, on the other, the view that the machinery and purposes of military security are incompatible with environmental values? A hard look at institutional priorities continues to be in order while the process of commitment is still reversible."

Furniss, Edgar S., Jr. "Western Alliance Development and Technological Cooperation." Written for the U.S. House of Representatives Republican Committee on NATO and the Atlantic Community. *International Studies Quarterly*, v. 11, no. 4, December 1967: 339–52.

Review by the late director of the Mershon Center for Education in National Security, Ohio State University, an authority on NATO of organizational and program needs for technological programs in the Western alliance community. "Each country should be included . . ." in the contribution, administration and distribution phases of a Western alliance program of technological cooperation. Such programs might involve the following substantive fields: communication, "war on poverty," transit and transport, agricultural productive techniques, education, and space. Implications of such a program for American policy are also discussed.

Huntley, James R. *Man's Environment and the Atlantic Alliance*. 2d ed. Brussels NATO Information Service, 1972. 63 p.

Details the environmental activities of NATO's Committee on the Challenges of Modern Society (CCMS).

"The Influence of Science and Technology in Present Day Foreign Policy", Organisation for Economic Co-operation and Development, Paris, France, *Science Policy Information 3*, 1967: 47–48.

"An analysis of the interaction of science and foreign policy in industrialized nations, by Manfred Schreiterer, a member of the German Delegation to the OECD. Nowadays foreign policy, economic policy, military policy, and science policy are interdependent; numerous examples of the important role of science and technology in modern foreign policy are given (e.g., French agreement on technical cooperation with Eastern European countries, and the acceptance by the Soviet Union and others of the French color television system); 'Could not Germany's old-established reputation in science and technology be used to bring about a political detente with her Eastern European neighbors?' Conversely, foreign policy could influence certain aspects of science and educational policy, for instance, the determination of scientific priorities, and the problem of scientific and technological disparities has become one of the principal preoccupations of foreign policy." (4)

Kyba, Patrick. "CCMS: the Environmental Connection." *International Journal,* v. 29, spring 1974: 256–267.

Describes the role assigned to NATO's environmental agency, the Committee on the Challenge of Modern Society, explains the difficulties of performing those functions and goes on to suggest it shift its focus to study the effect of the military on the environment.

"NATO Science." Chapter 6 of: Francis A. Beer. *Integration and Disintegration in NATO: Processes of Alliance Cohesion and Prospects for Atlantic Community.* A Publication of the Mershon Center for Education in National Security. The Ohio State University Press, 1969, p. 204–238. (314 pages plus index.)

This study is a comprehensive review of important facets of NATO's programs, needs, and impacts as of 1969. Treated are: political consultation in NATO, integration of NATO military forces, leadership, functionalism, and spillover of NATO, military forces, armaments, organizational infrastructure, science, and future roles. The data base is derived from extensive field research and interviews with NATO officials, and officials of the governments forming the NATO alliance.

The chapter on NATO Science treats formal and informal organizational, leadership, and decision-making structures. Programs, expenditures, the objectives of member governments and trends in developing an integrated science program relevant to member states and the Alliance are also reviewed. With respect to development of an effective integrated science program, the author observes that support for NATO science depends primarily on a "common interest in Western political-military cohension, scientific progress, and information exchange." However, this shared goal is not strong enough to mitigate particular national interests weakening the program.

Organisation for Economic Co-operation and Development. Environment Directorate. *Environmental Standards: Definitions and the Need for International Harmonization.* Paris, 1974. 26 p.

Pollution control—[OECD countries]/International environmental cooperation.

Organisation for Economic Co-operation and Development. *International Scientific Organisations.* Catalog preceded by an introduction of Some Aspects of International Scientific Co-operation. Paris, Organisation for Economic Co-operation and Development, February 1965. 281 p.

Study compiled in preparation for the Ministerial Meeting on Science of the OECD countries, held in Paris (October 3–4, 1963.) The introduction describes the organization, history, structure and evolution of various types of multilateral cooperation in science. The catalog, limited to international science organizations to which members of the OECD countries belong, includes both intergovernmental and nongovernmental organizations.

Organisation for Economic Co-operation and Development. *International Scientific Organisations: Supplement.* Paris, Organisation for Economic Co-operation and Development, 1966. 84 p.

A supplement to the descriptive volume published in 1965. Organizations covered in this review include: the Food and Agriculture Organization of the United Nations, the World Health Organization, the International Hydrographic Bureau, the International Council for the Exploration of the Sea, the International Commission for the Scientific Exploration of the Mediterranean Sea, the International Commission for Agricultural Industries, the Southeast Asia Treaty Organization, and the Central Treaty Organization. With respect to each activity the following topics are covered: background information, objectives, membership, structure and procedure, personnel, finance, external relations, activities, remarks, references and organization charts.

Organisation for Economic Co-operation and Development. *OECD at Work for Environment.* [Paris] 1971. 57 p.

Describes the principles and philosophy of OECD's action in this field. Reviews the competent bodies of the organization and their functions. Examines prospects for the future.

Organisation for Economic Co-operation and Development. *OECD at Work for Industry and Energy.* Paris, Organisation for Economic Co-Operation and Development, 1973. 47 p.

Describes work in the industry and energy sectors carried out by the Committees and working parties of OECD with the Organisations, Industry and Energy Directorate.

Organisation for Economic Co-operation and Development. *OECD at Work for Science and Education.* Paris, Organisation for Economic Co-operation and Development, 1972. 68 p.

Begins by describing OECD's structures and strategies in the fields of science and technology, and then in education. These are followed by descriptions of OECD's programs in the two areas, together with that of the OECD Center for Educational Research and Innovation. Separate chapters deal with the OECD's work on Road Research and Education.

Organisation for Economic Co-operation and Development. Secretary General. *Activities of OECD in 1973; Report.* [Paris, c. 1974] 112 p.

Partial contents.—Economic policy.—Trade policy.—Capital movements, financial and fiscal affairs.—Agriculture and fisheries.—Industry and energy.—Manpower and social affairs.—Development cooperation.—Technical cooperation.—Environment policy.—Road research.—Relations with other international organizations.

O'Sullivan, Dermot, A. "World Science Leaders Examine Social Needs: Problems Facing Developing Countries and a Closer Coordination of Natural and Social Sciences Drew Attention At Paris Meeting." *Chemical and Engineering News,* July 28, 1975: 15–16.

This is a news report on a two-day OECD ministerial conference on Science and Technology in the Management of Complex Problems. Several important themes were raised: the need to give greater recognition to the potential of the social sciences in solving the world's problems; the allocation of more scientific research resources to the social sciences; the need for more public awareness of the purposes and utility of science; the need for studies of natural resources management; and improved methods to secure technology transfer.

Rannestad, Andreas. "Scientific Co-Operation in NATO." *NATO Review,* v. 21, no. 2, 1973: 23–26.

Summarizes the larger study, *Scientific Cooperation in NATO: Information on NATO Science Programmes,* describing the multifaceted research and educational activities of the civilian NATO Science Committee.

Schrader, Rudolf. "AGARD—Model for International Cooperation." *Aussenpolitik,* v. 22, no. 1, 1971: 102–114.

Describes the organization, function and working methods of the Advisory Group for Aerospace Research and Development (AGARD), a scientific agency of NATO, emphasizing the growing role of West Germany.

Shuman, Jack Norman. *An Analysis of the Science Policy Programs of the Organization for Economic Cooperation and Development.* A dissertation submitted to the Faculty of the Graduate School of Georgetown University in partial fulfillment of the requirements for the degree of Doctor of Philosophy. Washington, D.C., June 1970. Mimeo, 422 p.

"This dissertation is an examination of the science policy programs of the Organization for Economic Cooperation and Development. It centers on OECD's ability to provide a sharp focus on a central question, namely, what are the basic problems in the relationship of science and technology to public policy? Addresses also the shift in OECD science policy activities from looking at the benefits to the disadvantageous consequences of investment in some aspects of technology."

Smith, P. J. "NATO and Civil Science." *Nature,* v. 250, July 19, 1974: 174.

". . . NATO . . . sponsored 56 conferences on science subjects in 1972 in order to gain 'social respectability and prestige.' This sponsorship is 'totally unnecessary' as 60 percent of its science money is returned to agencies in member countries to administer and many of its programs duplicate other programs in these countries. . . . If an overtly international programme of science support is . . . desirable, it would be . . . preferable to . . . hand over the NATO scheme to some . . . nonmilitary organization such as UNESCO. However Paul Henri Spaak, NATO's 1957 Secretary General, believed that NATO's support of science would 'strengthen the Alliance and its political substance.' Perhaps, a little 'social respectability and prestige' are needed to overcome antimilitary prejudices toward NATO."

INTERNATIONAL TECHNOLOGY TRANSFER: GENERAL ISSUES AND PROCESSES

Adams, Scott. *Information for Science and Technology: The International Scene.* [Champaign] University of Illinois, Graduate School of Library Science, 1973. 45 p. (Illinois, University. Graduate School of Library Science. Occasional papers no. 109) "US ISSN 0073-5310"

Parital contents.—Information for postwar research and development.—Freedom of information.—New dimensions of international cooperation.—Information transfer to developing countries.

Allen, Thomas J., James M. Piepmeier, and S. Cooney. "The International Technological Gatekeeper." *Technology Review*, v. 73, Mar. 1971: 37-43.

"The international transfer of technology takes place through intermediary agents called technological gatekeepers. For greatest effectiveness, these men must be well integrated both into an external network of information sources and an internal network of users to who the information can be delivered."

Bar-Zakay, Samuel N. "Policymaking and Technology Transfer: the Need for National Thinking Laboratories." *Policy Sciences*, v. 2, summer 1971: 213-227.

"The author suggests that National Thinking Laboratories should be established to promote organized technology transfer and to act as catalysts to organized policymaking. Their charter should be to match needs in one context to capabilities in another context. This charter is outlined in operational terms by five general objectives listed by the author."

Bischel, Jon E. "Exportation of American Technology and the Federal Income Tax; part 1: Direct Transfers." *Syracuse Law Review*, v. 22, no. 4, 1971: 867-895.

Bischel, Jon E. "Exportation of American Technology and the Federal Income Tax, part II: Indirect Transfers." *Syracuse Law Review*, v. 23, no. 1, 1972: 1-32.

Follow-on to 1971 article on direct transfers of technology. Discusses technology transfer abroad as affected by the Federal income tax. Focuses in particular on nonrecognition and deferral tax provisions and on international income allocation regarding the use of intangible property.

Bobrow, Davis B. *Technology-related International Outcomes: R and D Strategies to Induce Sound Public Policy.* Pittsburgh, International Studies Association, University of Pittsburgh, Occasional paper no. 2, 1974. 60 p.

"The discussion presented in this paper seeks to provide a starting point for a doctrine for making and shaping R&D decisions which are directed to the production of desirable and feasible public policy for technology-related international problems. Designs for purposeful action involve three related statements: performance goals, operational requirements for their realization, and the action instructions necessary to meet these requirements. The strategic problem for the R&D decision-maker is to devise and induce those policy institutions and actions which will make the probabilities of desired international outcomes substantially greater than they would be otherwise. Explicitly or implicitly, the R&D results sought are sets of instructions which if followed will either produce an outcome reflected in advance or at least provide reasoned judgments about what outcomes are desired and feasible. Using these design standards, the paper focuses on the most prevalent approaches now current to determine their premise in meeting these standards and the extent to which they are adapted to the strategic problem mentioned earlier. As a result of this limited appraisal an alternative approach is offered at a high level of generality, based on the premise that if pursued for a number of years at substantial expenditure for international incomes, it stands an inherently better chance of meeting the strategic problem than do the current approaches which are briefly analyzed. After a summary of the notions introduced for R&D strategies for technology-related international outcomes, the paper concludes with a recommended program of 'experiments' to determine the value, to relevant officials, of the alternative R&D

approaches discussed in the paper. A bibliographic note is provided, along with a list of participants in the NSF–ISA conference on the subject held May 16–17, 1974, in Washington, D.C." (Supported by NSF RANN award: GI–39444.)

Boretsky, Michael. "Trends in U.S. Technology: a Political Economist's View." *American Scientist*, v. 63, Jan.–Feb. 1975: 70–82.

"Decline in the rate of growth of technological innovation and rapid dissemination throughout the world of U.S. technology in a 'naked' form are having dismal repercussions on our economy."

Boretsky, Michael. *U.S. Technology: Trends and Policy Issues*. Program of Policy Studies in Science and Technology. Washington, D.C., 1973. 175 p.

The loss of U.S. technological advantage is due to: (1) relatively low growth of investment in new industrial plants and equipment since World War II; (2) relatively small investment in economically-relevant-research and development; and (3) a one-sided global diffusion of U.S. advanced technology in a "naked" form. After detailing these issues, the author "argues the case for a comprehensive national technological policy which he defines as the sum of deliberate actions on the part of the U.S. federal government aimed at the increase and improvement of technological options and alternatives for all productive units in the economy for the furtherance of national objectives within resource constraints." He discusses a number of options which could be included in such a policy.

Brady, Edward L. and Lewis A. Branscomb. "Information for a Changing Society." *Science*, v. 175. Mar. 3, 1972: 961–966.

This article analyzes an OECD report entitled "Information for a Changing Society." The report is concerned with national and international policy relating to information systems in science and technology.

Chang, Y. S. *The Transfer of Technology: Economics of Offshore Assembly, the Case of Semiconductor Industry*. [New York] UNITAR, 1971. 59 p. (United Nations Institute for Training and Research. UNITAR research reports, no. 11.)

"Civilian Technology Role Takes on New International Dimension." *Professional Engineer*, v. 43, Apr. 1973: 42–45.

"Positive policy actions by Government can restore lost technological momentum in the U.S. If American exports are to compete equally, they must be able to enter the market supported by an export finance policy at least equal to that of other nations."

Danhof, Clarence H. *The Effects of International Technology Transfers on the U.S. Economy: Present Understanding, and its Implications for Public Policy and Research Priorities*. Preliminary Papers prepared for a colloquium to be sponsored by the National Science Foundation. October 1973: 117 p.

Includes: "Introduction and Summary," Rolf R. Piekarz; "A Summary and Assessment of Research Findings on U.S. International Transactions Involving Technology Transfers," Robert B. Stobaugh; "Effects of International Technology Transfers on the U.S. Economy," Richard E. Caves; "Technology Transfers and the American Economy," Gary C. Hufbauer; " 'International' Technology and the U.S. Economy: Is There a Problem?" Keith Pavitt; and "Selected Bibliography."

Feld, Bernard T. "What Is Pugwash Anyway?" *Nation*, v. 215, 1972: 431–435.

"Scientists (mainly natural scientists, but later a significant fraction of political, social and behavioral scientists as well) meet as individuals, informally and unofficially, to discuss world problems arising from science and technology."

Gellman Research Associates, Inc. *Economic Regulation and Technological Innovation: A Cross-National Literature Survey and Analysis*. Vol. I, prepared for the National Science Foundation, National R and D Assessment Program, Washington, D.C. January 1974. 203 p. USC/FAR Proj. No. 19118–73. Available from the State Dept. as FAR 22241–G.

"International Communications: Freedom of Information and Cultural Integrity." *FAR Horizons*, v. VII, No. 2, Spring 1974: 1–4. (Newsletter for the Undersecretaries Committee, Subcommittee on Foreign Affairs Research, U.S. Dept. of State.)

Report on Conference, held in Feb. 1974, attended by representatives of academia, the media, and the government on the topic of assisting the United States to develop policy alternatives for "situations in which foreign governments assert the right to control or limit international communications in order to protect the cultural integrity of their societies." A list of background papers presented is included.

International Information, Education, and Cultural Relations: Recommendations for the Future. Washington, Georgetown University, Center for Strategic and International Studies, 1975. 85 p.

Janssen, Jules J. A. "Microprojects: Transfer of Technology by Mail." *International Development Review/Focus,* v. 17, no. 2, 1975: 9–12.

"The objective of a microproject is to offer, through correspondence, socially as well as technically sound advice for solving LDC technical problems. Certain measures have been identified which serve to alleviate the difficulties inherent in the transfer of technology by mail."

Joelson, Mark R. "International Technology Transfers and the United States Antitrust Laws." *Journal of International Law & Economics,* v. 8, June 1973: 85–112.

Covers the drafting of an international technology agreement with respect to territorial restrictions, price restrictions, field of use restrictions, tying arrangements, package licensing, royalty formulas, grantbacks, and cross-licenses and patent pooling.

Kay, David. "International Transfer of Marine Technology: the Transfer Process and International Organizations." *Ocean Development and International Law Journal,* v. 2, winter 1974: 351–377.

"This article is concerned with describing and evaluating the approaches by international organizations in their efforts to facilitate the transfer of technology."

Knezo, Genevieve J. *International Technology Transfer: A Selected Bibliography.* In U.S. Congress. House. Committee on Science and Astronautics. Subcommittee on International Cooperation in Science and Space. *International Science and Technology Transfer Act of 1974.* Hearings, 93d Cong. 2d sess. May 1974. Washington, U.S. Govt. Print. Off., 1974. pp. 161–166.

Kohler, B.M., A.H. Rubenstein, and C.F. Doubbs. "A Behavioral Study of International Technology Transfer Between the United States and West Germany." *Research Policy,* v. 2, Oct. 1973: 160–184.

Laszlo, Ervin, "World System Research and Information Bureau: A Proposal." *International Association,* no. 1, Jan. 1974: 34–38.

This is a proposal for the creation of an international information gathering, evaluating and disseminating agency, functioning in the supranational interests of mankind.

McLin, Jon. "Technology and Transatlantic Relations; Part I; Export Controls and Conditions of Competition." [Hanover, N.H., American Universities Field Staff] 1970. 8 p. (American Universities Field Staff. Field staff reports. West Europe series, v. 5, no. 7 [General].)

"Measuring the Impact of Academic Exchange." *FAR Horizons,* v. VII, no. 2, Spring 1974: 4–6.

Discusses the second phase of a two phase study by the International Committee for the Study of Educational Exchange. The topics assessed are: the long-term effects of international exchange and ways to cope with problems that confront exchanges.

Nau, Henry R. *Technology Transfer, U.S. Foreign Policy and the International System.* Paper prepared for delivery at the 1975 Annual Meeting of the American Political Science Association, San Francisco, September 1975. 40 p. plus bibliography. (Research is part of the project on "Technology Transfer and U.S. Foreign Policy," funded by the NSF Grant ST–44205.)

"In the postwar period, the outflow of U.S. technology to foreign countries has been dealt with in three separate and largely unrelated policy contexts: (1) strategic-military emphasizing export controls on technology to communist countries (2) foreign assistance involving the use of U.S. technology to obtain political-diplomatic benefits and (3) the multinational company reflecting the transfer of technology within an integrated economic structure cutting across national boundaries. This paper assesses and compares the motivations, mechanisms, and effects of technology transfer in these separate contexts and seeks to identify overall patterns affecting the use of American technology in foreign affairs. The patterns identified include: (1) While strategic-military and foreign policy motivations have dominated the use and evaluation of technology transfer in the past, economic and social criteria have become more important today, raising difficult issues concerning the pricing of technology in international economic exchanges. (2) While high-level government agencies have set the framework for foreign policy-related technology initiatives in the past and technical agencies or private industry have implemented these initiatives largely through the private sector, government and industry may have to develop mixed public-private mechanisms for technology transfer in the future, reflecting both the declining role of government in funding new industrial technology in the U.S. and the growing hostility to U.S. direct investment abroad. (3) While the effects of U.S. technology transfer in the past, particularly through private investment have been direct and associated with American commercialism and mass culture, these effects in the future may be considerably attentuated, since U.S. technology may be exported more frequently independent of equity or management control and thus be influenced more by local inputs of materials and personnel."

Organisation for Economic Co-operation and Development. *Towards Central Government Computer Policies: Data Base Developments and International Dimensions,* By R. Pipe. Paris, Organization for Economic Cooperation and Development, 1973. 220 p. (OECD Informatics Studies, No. 5.)

Presents and analyzes the important characteristics of government policies in computer utilization in fourteen OECD member countries and a number of findings relevant to automated data processing at government policy levels are developed.

Perspectives on International Scholarly Exchange. Report of a conference held by the Committee on International Exchange of Persons at the National Academy of Sciences Summer Studies Center, Woods Hole, Mass., August 24–25, 1972. Washington, D.C., Council for International Exchange of Scholars, 1974. 30 p.

Peters, E. Bruce. "Are We Giving Away Our Science and Technology?" *The Journal Of Business Communication,* v. 12, no. 2, Winter 1975: 3–19.

The author offers empirical evidence to demonstrate that an open scientific and technical information policy does not necessarily disadvantage a Nation's capability, but on the contrary tends to enhance it, by generating substantial return information flow.

Peters, E. Bruce. "Cultural and Language Obstacles to Information Transfer in the Scientific and Technical Field." *Management International Review,* v. 15, no. 1, 1975: 75–8[illegible]

"Anyone who has ever tried to work through an interpreter doesn't have to be told about cultural and language obstacles to an effective transfer of information and thought. It's hard enough to gain real communication within the homogeneous background of one's own family. As backgrounds become more divergent, the difficulties in communication increase in a corresponding manner.

"There is a voluminous body of writings by linguists, anthropologists, psychologists, and sociologists which points to the many difficulties of cross cultural communication. These potential obstacles are concerned not only with language but also the aspects of *unspoken* language, perception, cultural and occupational mores.

"Despite these many actual and potential barriers to communication, a body of recent empirical research shows that in some cases the obstacles have apparently been overrated as impediments to effective communication. This article first describes the potential obstacles and then the results of research on information transfer in international scientific and technological meetings."

Peters, E. Bruce. "International, Scientific and Technical Meetings: Why Go? Who Profits?" *R and D Management,* v. 5, no. 2, Feb. 1975: 139–147.

"A growing body of empirical research shows that information which is actually put to use is most often transmitted by personal contact. This article reviews the literature to examine some of the reasons for the importance of personal contact in the transmission of information and then focuses on scientific and technical meetings as an environment designed to facilitate the transmission of information in this way. The review of the literature is included for completeness in Part II of the article. However, it is the foundation on which the empirical research described in Part I is based.

Using the author's definition of meeting effectiveness this research shows that the person who is giving the most is also the most effective in gaining and utilizing information."

Pontecorvo, Giulid and Maurice Wilkinson. "An Economic Analysis of the International Transfer of Marine Technology." *Ocean Development & International Law,* v. 2, Fall 1974: 255–283.

"This paper develops a general economic framework for the analysis of international technology transfer, provides an analysis and categorization of countries, and concludes with a case study on the Peruvian fish-meal industry."

Priority Research Needs on Technology-related Transnational and Global Policy Problems. Report of a workshop held on March 7–8, 1973, at Brookline, Mass. under the joint sponsorship of the Center for International Studies, MIT, and the Research Applied to National Needs Program of the National Science Foundation. Cambridge, Center for International Studies, MIT, July 1973. 106 p.¶

A detailed statement on hard and "soft" research required by the United States to deal with technology related international policy issues.

Pugwash Conference on Science and World Affairs. *Proceedings of the Seventh International Conference on Science and World Affairs: International Cooperation in Pure and Applied Science.* Stowe, Vermont, September 5–9, 1961. [1961] 209 p.

"Forty-seven participants from 12 countries met at Stowe, Vt., September 5–9, 1961, to discuss International Cooperation in Pure and Applied Science. This conference was the seventh in the series of meetings between scientists from many countries on Science and World Affairs. . . . The papers in this volume were prepared by the participants for presentation at the plenary session and for consideration by the six working groups." Among the papers included are the following: "International Scientific Cooperation and the Prospects for its Development," A. V. Topchiev; "Recent Experiences in International Cooperation in Pure and Applied Sciences," Roger Revelle; "International Cooperation in Cancer Research and a Peaceful World."

"A Return Flow of Technology From Abroad." *Fortune*, v, 88, no. 2, Aug. 1973: 63.

Rotblat, Joseph. *Pugwash—the First Ten Years. History of the Conferences of Science and World Affairs.* [By the Secretary General, Pugwash Continuing Committee.] New York, Humanities Press, 1968, 231 p. plus index.

Documents and describes the history of the International Conferences on Science and World Affairs (commonly known as Pugwash Conferences), convened as a private effort by scientists from all over the world. Illustrates the private international collaboration of scientists in common problems and research efforts. Also included are the summary statements from each of the conferences held. Conferences have treated: nuclear weapons and atomic energy; arms control, biological and chemical warfare; pure and applied science; role of scientists in world affairs and the potential role of science in promoting development.

Schmidt-Kolmer, Eva. *Report on the Implications of Scientific and Technological Developments for the Situation of Women and Their Integration in Development: a Point of View.* [New York, United Nations] 1975. 24 p. (United Nations. [Document] E/CONF. 66/BP/7)

At head of title: United Nations.

At head of title: World Conference of the International Women's Year, Mexico City, 19 June 2 July 1975.

"A Scientific and Technical Information Policy." *The OECD Observer*, No. 53, April 1968: 36–38.

"This article summarizes some of the findings of an OECD Scientific and Technical Information Policy Group set up 'to identify the main policy issues on scientific and technical information and the scope for international cooperation in dealing with them.' The Group has shown the need for the following kinds of national and international action: (1) 'Identification of priority areas for international cooperation, and of the consequent policy issues and action for national bodies'; (2) 'Cooperation in building up new international systems,' and (3) A 'concerted approach to common problems.' "

Spencer, Daniel Lloyd. *Technology Gap in Perspective: Strategy of International Technology Transfer.* New York, Spartan Books, 1970.

After assessing several factors important to U.S. technology transfer policies, the author proposes an international technology agency to "exercise surveillance at crucial points." "A framework is developed enabling American and foreign interests to learn to live with efficient technology transfer and adaptation requiring tradeoffs at the interfaces."

Technology and International Trade. Washington, National Academy of Engineering [available from NTIS] 1971. 146 p.

Contents.—Technology and U.S. trade: a historical review, by R. Cooper.—Concerns about the present American position in international trade, by M. Boretsky.—Technology and industry structure, by A. Phillips.—Computers and international trade, by J. Maisonrouge.—The automobile and international trade, by R. Gerstenberg.—Textiles and international trade, by B. Dent.—Machine tools, imports, and national security, by H. Sharpe, Jr. PB 205 012.

Teich, Albert H. "Politics and International Laboratories: a Study of Scientists' Attitudes." *In Scientists and Public Affairs*, edited by Albert H. Teich. Cambridge, The MIT Press [1974]. pp. 173–236.

Evaluation of role of scientists in three European laboratories: CERN, ESTEC, and ISPRA.

UNISIST: Synopsis of the Feasibility Study on a World Science Information System. By the United Nations Educational, Scientific and Cultural Organization and the International Council of Scientific Unions. Paris, UNESCO, 1971. 92 p.

Deals with cultivating the exchange of scientific information and with increasing international cooperation to improve its accessibility and use as an international resource to promote the scientific, educational, social, cultural, and economic development of all nations. Recommendations to improve communication are included.

U.S. National Aeronautics and Space Administration. *Significant NASA Inventions, Available for Licensing in Foreign Countries*. Washington [For sale by the Supt. of Docs., U.S. Govt. Print. Off.] 1974. 73 p. (U.S. National Aeronautics and Space Administration. NASA SP-7038 (02))

"This publication includes abstracts of those inventions in which NASA owns the principal or exclusive rights and which have been made available for patent licensing in the countries indicated."

U.S. National Science Foundation. *The Effects of International Technology Transfers on U.S. Economy: Papers and Proceedings of a Colloquium Held in Washington, D.C., November 17, 1973*. Washington [For sale by the Supt. of Docs., U.S. Govt. Print. Off.] 1974. 109 p.

"NSF 74-21"

"The papers in this volume stem from interests and concerns expressed by the Science Adviser to the President and by the Executive Office of the President on the status of research and knowledge of international technology transfer."

United Nations. *Transfer of Operative Technology at the Enterprise Level*. New York, United Nations, 1972. E. 72. II.A.1.

United Nations. Secretary-General (Waldheim). *Human Rights and Scientific and Technological Developments: Uses of Electronics Which May Affect the Rights of the Person and the Limits Which Should be Placed on Such Uses in a Democratic Society; Report*. [New York] 1974. 25 p. (United Nations. [Document] E/CN.4/1142/Add.2)

Wolf, Alfred. "Trends in the International Licence Trade." *Intereconomics*, no. 5, May 1973: 150–153.

"The term 'international licence trade' signifies the worldwide buying and selling, across national frontiers, of technical and industrial licenses. In contrast to the trade in goods, which involves the exchange of material goods, the transfer of licences concerns immaterial goods, i.e. legally protected industrial property rights (patents, registered or ornamental designs, copy rights) and unprotected technical knowledge and inventions (the so-called 'know-how')."

INTERNATIONAL TECHNOLOGY TRANSFER AND TECHNICAL ASSISTANCE: THE DEVELOPING NATIONS

A. General and International Issues

Baranson, Jack. *International Transfer of Automotive Technology to Developing Countries.* [New York] UNITAR, 1971. 95 p. (United Nations Institute for Training and Research. UNITAR research reports, no. 8).

Bilateral Institutional Links in Science and Technology, No. 13, Science Policy Studies and Documents, UNESCO, Paris, 1969. 98 p.

"This report is a 'survey and analysis of the existing extent of co-operative links in the field of science and technology, between advanced and developing countries' and, in addition, it makes 'proposals for promoting the wider introduction of such arrangements.' Based primarily on questionnaires, the study covers details of several hundred current bilateral institutional links. A selected list of several hundred bilateral institutional links involving universities, research institutions, museums, private enterprises and cooperative industrial research associations is presented, which includes the linking institutes from the developing country and the advanced country, and the subject field. (This 'list is not presented as comprehensive; its purpose is rather illustrative'). Other topics covered include: bilateral institutional links combined with United Nations activities, role of non-government organizations, advantages of institutional links, Unesco's programme for promoting institutional links, 'industrial research associations: their potential contribution to overseas development,' 'bilateral aid for development,' and 'East-West co-operation in academic aid to developing nations.'" (4).

Caustin, Harold. *The Search For New Methods of Technical Co-operation: a Report on a UNITAR Weekend Seminar 30 June–2 July 1972 at the Institute of Development Studies,* Sussex University, England. New York, United Nations Institute for Training and Research, 1974. 85 p. (United Nations Institute for Training and Research. Conference report no. 4, 1974)

Hawthorne, Edward P. ***The Transfer of Technology.*** **[Paris] Organization for** Economic Co-operation and Development [1972] 148 p.

"The Ministers responsible for Science and Technology in the OECD countries recommended, at their Third Meeting, that special attention should be given to the problem of the technological gap in the less-developed member countries of the Organisation. Accordingly, in October 1970 the OECD organised a Seminar at Istanbul on the subject of the transfer of technology."

Holsti, K. R. "Underdevelopment and the 'Gap' Theory of International Conflict." *American Political Science Review,* vol. 69, no. 3, September 1975: 827–839.

"A common hypothesis about the sources of international conflict holds that war and turmoil will be an inevitable consequence of the widening 'gap' between the developed and underdeveloped states. This view is based on a common Western image of underdeveloped countries which assumes that striving for economic betterment is universal in all underdeveloped countries, and is primarily a grassroots phenomenon. This essay challenges the hypothesis and the assumptions upon which it is based. It argues that the images of underdevelopment generated by economists using aggregated data are in many cases incorrect or distorted. Studies by anthropologists which are based on micro- rather than macro-data produce quite different impressions of the underdeveloped society. The human costs involved are for the most part overlooked in development schemes, and the wholesale importation of Western economic development strategies has led in many cases not only to a poor allocation of resources but also to many of the problems the developed societies are now facing, including urban congestion, rising crime rates, higher incidence of mental breakdown, and the like." The paper criticizes some "common liberal solutions to develop problems. . . ." (5)

Hutchins, Robert M. ***The Future of International Education.*** **New York, United Nations Institute for Training and Research, 1970. 22 p. (UNITAR lecture, series #4.)**

Meeting the Challenge of Industrialization: a Feasibility Study for an International Industrialization Institute. **Report of a special international panel of the Board on Science and Technology for International Development, Office of the Foreign Secretary. Washington, D.C., National Academy of Sciences-National Academy of Engineering. Washington, D.C. 1973. 131 p.**

Assesses the concept and organization of creating an international industrialization institute to perform research on new approaches to international industrialization that would benefit developing countries. "The consensus of those interviewed was that an institute as envisioned by the panel could contribute invaluably to the more orderly and harmonious industrial development" of both developing and developed worlds.

Moravcsik, Michael J. and J. M. Ziman. "Paradisia and Dominatia: Science and the Developing World." *Foreign Affairs*, v. 53, no. 4, July 1975: 699-724.

The authors elaborate on the following themes: ". . . insufficient thought and effort is being given to creating and maintaining indigenous scientific activity in the less-developed countries. The actions of the countries concerned are uncoordinated, and are often based on very poor grasp of the real issues. The world scientific community is negligent of the plight of this small fraction of its members. The international agencies lack the resources, and the big aid programs, such as those of the U.S. government, lack the understanding, to act effectively. A highly significant fraction of general social and economic development, with enormous long-term leverage, is being left at the mercy of a variety of haphazard forces—political whim, crude economic theory, intellectual fashion, administrative convenience."

Concluding observations address the need for additional study on interaction patterns and closer communications links between scientists of the developed and developing nations.

Organisation for Economic Co-operation and Development. *Choice and Adaptation of Technology in Developing Countries: an Overview of Major Policy Issues.* Paris, Organisation for Economic Co-operation and Development, 1974. 242 p.

Reviews major policy issues of technology for developing countries, including terminology, and philosophy; factor prices and the dual economy; multinational cooperation; the role of engineering and the cost of technology transfer; science and industry; the measurement of technology; technology assessment and modules of technology.

Organisation for Economic Co-operation and Development. Development Center. *The Role of the Technical Assistance Expert.* Paris, Organisation for Economic Co-operation and Development, 1975. 160 p.

Organisation for Economic Co-Operation and Development. Development Center. "Towards New Forms of Co-Operation in Development Research and Training. International Meeting of Directors of Development Research and Training Institutes. Abidjan, Ivory Coast, August 1974." *Liaison Bulletin*, No. 1, 1975.

Various themes relating to the problems of collaboration in research and training were discussed by representatives of regional and international development associations. The papers in this Bulletin deal with the concept of development, training for development, the roles of regional institutes in development and training for development, development of a European Association of Development Research and Training Institutes, a projected association of Arab Development Research and Training Institutes, exchanges of experiences on development training and research programmes and descriptions about regional associations of development institutes.

Pool, Ithiel de Sola, Philip J. Stone and Alexander Szalai. *Communications, Computers and Automation for Development.* [New York] UNITAR, 1971. 61 p. (United Nations Institute for Training and Research. UNITAR research reports, no. 6)

Futuristic speculations on the role of computers, automation, and communications technology changes in developing countries during the Second Development Decade.

Ritchie-Calder, Lord. "New Dimensions and Opportunities in the Application of Science and Technology to Development and the Role of the United Nations Family." [New York, United Nations] 1973. 69 p. (United Nations. [Document] E/5238/Add. 1)

This document is an addendum to the Secretary-General's report (E/5238), The Role of Modern Science and Technology in the Development of Nations and the Need To Strengthen Economic and Technico-Scientific Cooperation Among States.

Seaborg, Glenn T. "Science, Technology, and Development: A New World Outlook." *Science*, v. 181, n. 4094, July 6, 1973: 13–19.

Discusses problems of energy, education, environmental quality, urbanization and the resulting need for cooperation in science and technology between the United States and the Latin American nations.

Schumacher, Ernst F. "Intermediate Technology." *Center Magazine*, v. 8, Jan.–Feb. 1975: 43–49.

Describes the operation of an organization to help developing countries apply "intermediate" technology to their problems.

Sperling, Philip. "Evaluating Training Programs: the AID Experience." *International Development Review*, v. 15, 1973–74: 9–13.

"A training evaluation system should be an instrument for reviewing past experience in order to improve future planning, but it is difficult to devise a system that both is easy to use and reliably reflects the opinions of participants and others involved in the programs."

Stobaugh, Robert B. *The International Transfer of Technology in the Establishment of the Petrochemical Industry in Developing Countries.* [New York] UNITAR, 1971. 65 p. (United Nations Institute for Training and Research. UNITAR research reports, no. 12).

Tarapore, Savak S. "Financing Technology Transfer to Developing Countries." *International Development Review*, v. 16, no. 2, 1974: 17–20.

"Changes in the international patents system and the establishment of an international technology transfer bank could help reduce the costs of technology transfers and encourage research and development efforts oriented toward the needs of developing countries."

United Nations. Conference on Trade and Development. *Proceedings of the United Nations Conference on Trade and Development*, third session, Santiago de Chile, 13 April to 21 May 1972. New York, United Nations, 1973. 138 p. (United Nations. [Document] TD/180, vol. III). "United Nations publication. Sales no. E. 73.II.D.6"

Partial contents.—Economic growth and development financing: issues, policies and proposals—report by the UNCTAD secretariat (TD/118).—Mobilization of resources for development: report by the UNCTAD secretariat (TD/118/Supp. 1).—External development finance: report by the UNCTAD secretariat (TD/118/Supp. 2).—The link: report by the UNCTAD secretariat (TD/118/Supp. 4).—The outflow of financial resources from developing countries: note by the UNCTAD secretariat (TD/118/Supp. 5).—Private foreign investment in its relationship to development: report by the UNCTAD secretariat (TD/134).—Tourism and developing countries: report by the UNCTAD secretariat (TD/142).—Policies relating to technology of the countries of the Andean Pact: their foundations: a study by the Board of the Cartagena Agreement (TD/107).

United Nations. Conference on Trade and Development. Secretariat. *Guidelines for the Study of the Transfer of Technology to Developing Countries; a Study.* New York, United Nations, 1972. iv, 59 p. 28 cm (United Nations Document, TD/B/AC. 11/9) United Nations publication. Sales no. E.72.II.D.19.

United Nations. Economic and Social Council. Advisory Committee on the Application of Science and Technology to Development. *World Plan of Action for the Application of Science and Technology to Development.* New York, United Nations, 1971. 286 p. (United Nations. [Document] E/4962/Rev. 1)

At head of title: Department of Economic and Social Affairs. "United Nations publication. Sales no.: E.71.II.A.18"

Part one lists priority areas in which science and technology can make a resounding impact and outlines proposals for implementation and financing of the Plan. Part two consists of more detailed proposals, presented for a wider range of areas.

United Nations. Economic and Social Council. Advisory Committee on the Application of Science and Technology to Development. *World Plan of Action for the Application of Science and Technology to Development: Report. Volume I.* [New York] 1971. 54, 3 p. (United Nations. [Document] E/4962)

At head of title: United Nations Economic and Social Council.

United Nations. Economic and Social Council. Advisory Committee on the Application of Science and Technology to Development. *World Plan of Action* *for the Application of Science and Technology to Development: Report. Volume II.* [New York] 1971. 1 v. (various pagings). (United Nations. [Document] E/4962/ Add. 1 (pts. 1–12))

United Nations. *Implementation of the International Development Strategy. Vol. I: Papers for the First Over-All Review and Appraisal of Progress During the Second United Nations Development Decade.* New York, United Nations, 1973. E.73.II.A.8.

United Nations. *Implementation of the International Development Strategy. Vol. II: Papers for the First Over-All Review and Appraisal of Progress During the Second United Nations Development Decade.* New York, United Nations, 1973. E.73.II.A.3.

United Nations. Proceedings of the United Nations Conference on Trade and Development. *Guidelines for the Acquisition of Foreign Technology in Developing Countries.* New York, United Nations, 1973. E.73.II.B.21.

United Nations. Proceedings of the United Nations Conference on Trade and Development. *Perspectives for Industrial Development in the Second United Nations Development Decade.* New York, United Nations, 1973 E.73.II.B.7.

United Nations. *Reviewing the Development Priority. Implementation of the International Development Strategy: First Over-All Review and Appraisal of Progress During the Second United Nations Development Decade.* New York, United Nations, 1973. E.73.II.A.7.

United Nations. Secretary-General (Waldheim). *Mid-term Review and Appraisal of Progress in Implementing the International Development Strategy; Programme of Action on the Establishment of a New International Economic Order: the Role of the Public Sector in Promoting the Economic Development of Developing Countries: Report* [New York] 1975. 49 p. (United Nations. [Document] E/5690/ Add.1)

At head of title: United Nations Economic and Social Council.

Economic development—[Developing countries].

United Nations. Secretary-General (Waldheim). *Possible Future Topics for Consideration by the Committee [on Science and Technology for Development].* [New York] 1973. 30 p. (United Nations. [Document] E/C.8/13)

At head of title: United Nations Economic and Social Council.

Presents the views of the U.N. Conference on Trade and Development, the International Labour Office and the World Meteorological Organization on their relationship with the Committee on Science and Technology for Development of the Economic and Social Council. Includes as addenda (E/C.8/13/ Add.1 and E/C.8/13/Add.2) the views of the Food and Agriculture Organization and the International Atomic Energy Agency.

United Nations. Secretary-General (Waldheim). *Science and Technology in the Second United Nations Development Decade: International Development Strategy: Note.* [New York] 1973. 18 p. (United Nations. [Document] E/C.8/10.)

At head of title: United Nations Economic and Social Council.

Concentrates on developing countries.

United Nations. Secretary-General (Waldheim). *Science and Technology in the Second United Nations Development Decade: Regional Aspects: Note.* [New York] 1973. 38 p. (United Nations. [Document] E/C.8/9).

At head of title: United Nations Economic and Social Council.

Covers the areas of Africa, Asia, the Far East, Europe, Latin America, and the Middle East.

United Nations. Secretary-General (Waldheim). *Science and Technology in the Second United Nations Development Decade: Role of Modern Science and Technology in the Development of Nations: Question of Convening a United Nations Conference on Science and Technology.* Report on the Second Session, 11–29 Mar. 1974. [New York, United Nations] 1974. 5 p. (United Nations. [Document] E/C.8/25).

At head of title: United Nations. Economic and Social Council. Committee on Science and Technology for Development.

United Nations. Secretary-General (Waldheim). *United Nations Technical Co-operation Activities; Report.* [New York] 1975. 69 p. (United Nations. [Document] DP/RP/16)

At head of title: United Nations Development Programme.

United Nations. UNCTAD Secretariat. "Major Issues Arising from the Transfer of Technology to Developing Countries: Report by the UNCTAD Secretariat." New York, United Nations, 1975. 50 p. (75.II.D.2.)

United Nations. World Plan of Action. *African Regional Plan for the Application of Science and Technology to Development.* New York, United Nations, 1973. E.73.II.K.3.

Wortzel, Lawrence H. *Technology Transfer in the Pharmaceutical Industry.* [New York] UNITAR, 1971. 53 p.

"The purpose of this paper is to assess the present state of pharmaceutical manufacturing and related technology in the developing countries, and to make recommendations as to if, and how this technology can be better transferred to these countries. This paper, therefore is a study of technology transfer, within a single industry."

B. ISSUES RELATING TO A DONOR NATION

Beach, Nancy. Research *Priorities on Technology Transfer to Developing Countries, Vol. II: Survey of Selected Studies and Research on Technology Transfer to Developing Countries.* Evanston, Northwestern University, Northwestern Document no. 74/61. June 1973, Rev. July 1974. 61 p.

"This literature survey and bibliography was prepared for use at two NU/NSF workshops on technology transfer to developing countries held at Northwestern University in May, 1973, and Washington, D.C., in September, 1973." (Supported by NSF RANN award: GI–39239.)

Brown, Harrison, and Theresa Tellez. *International Development Programs of the Office of the Foreign Secretary.* Prepared for the Board on Science and Technology for International Development. Washington, D.C., National Academy of Sciences, 1973. 68 p.

Analytic description of the NAS and NAE workshops, studies, and special projects performed in cooperation with AID to strengthen national science and technology policies, priorities, and organizations in the developing countries. Includes a list of publications to 1973.

Chudson, Walter A. *The International Transfer of Commercial Technology to Developing Countries.* [New York] UNITAR, 1971. 58 p. (United Nations Institute for Training and Research. UNITAR research reports, no. 13)

"The purpose of the project of which this paper forms a part is to describe, analyze and evaluate the transfer of 'commercial', that is marketed, technology to developing countries from industrialised countries through 'enterprise-to-enterprise' arrangements. These include direct investment (including joint ventures), licensing, management contracts, 'turnkey' projects, and the installation and servicing of purchased industrial equipment."

"The Future of Our AID Programs." Remarks of Hon. Hubert Humphrey on the floor of the Senate. *Congressional Record* (daily ed.) June 12 and June 13, 1975.

Contains prepared testimony of witnesses at a hearing held by the Foreign Assistance Subcommittee to review our foreign aid programs and develop new priorities for new foreign assistance legislation in the light of changing global realities. The reprinted testimony was delivered by: George Ball, McGeorge Bundy, Joseph S. Nye, James Brant, C. Fred Bergsten and Edward Fried.

According to Senator Humphrey, "The panelists called for a new relationship with the Third World countries, stressing economic interdependence and cooperation. They expressed the need to continue food and technical assistance to the 'Fourth World'—the poorest of the poor."

Harari, Denyse. *The Role of the Technical Assistance Expert, An Enquiry into the Expert's Identity, Motivations, and Attitudes.* Paris. Organisation for Economic Co-operation and Development, January 1975. 159 p.

Howe, James W. ed. *The U.S. and World Development: Agenda for Action 1975.* New York, Praeger Publishers, 1975. 277 p.

"This is the third annual summation of staff work by the Overseas Development Council. 'It concentrates on the shortrun future and the immediate past, the typical and necessary focus of policy makers.' The crisis areas and the responses it describes are: food and hunger (international machinery already set in motion includes international grain reserves); population (underdeveloped countries have already begun to act, but international commitment remains crucial); oceans (where international delay will produce only unwise unilateral actions); international trade (a need not yet recognized by nationalists in their short-sighted concentration on restricting imports and exports); recession and inflation (international mechanisms can reduce the most serious consequences but are not yet adequate); the fourth, or least developed world (the 42 countries containing a quarter of the world's population, about which almost nothing hopeful or significant is said); and excessive military expenditures in the developing countries (the U.S. responsibility, based on arms sales, is double that of the Soviet Union.)"(2)

Hunter, Robert E. ed. *The United States and the Developing World: Agenda for Action, 1973.* Washington, D.C., The Overseas Development Council, 1973. 162 p.

Analysis of "the most important issues in U.S. relations with the poor countries, present alternatives for action by the U.S. Government . . . and Council recommendations." Substantive issues addressed include: trade and monetary systems, U.S. private investment in developing countries, new financial resources for poor countries, security dimension of foreign aid, the ocean and developing countries, energy supply and demand, energy dependence, environment, and population.

The International Development Institute. A report of an Ad Hoc Committee of the Board on Science and Technology for International Development, Office of the Foreign Secretary. Washington, D.C., National Academy of Sciences, July 1971. 57 p.

Endorses the concept of such an Institute as proposed by the President of the United States. Sept. 15, 1970, to assist in developing a reorganized foreign aid program.

Morris, Robert C. *Overseas Volunteer Programs: Their Evolution and the Role of Government in Their Support.* Lexington, Mass., Lexington Books, Div. of D. C. Heath and Co., 1973.

National Academy of Sciences. *Research Management and Technical Entrepreneurship: A U.S. Role in Improving Skills in Developing Countries.* A report of an ad hoc advisory panel of the BOSTID [Board of Science and Technology for International Development]. Washington, D.C., National Academy of Sciences, September 1973. 40 p. Available as PB 225-129/6.

National Academy of Sciences. *Scientific and Technical Information for Developing Countries.* A report of an ad hoc advisory panel of the BOSTID [Board of Science and Technology for International Development]. Washington, D.C., National Academy of Sciences, 1972. 80 p. Available as PB 210-107.

Ozawa, Terutomo. *Transfer of Technology from Japan to Developing Countries.* New York, UNITAR, 1971. 50 p. (United Nations Institute for Training and Research. UNITAR research reports, no. 7)

"The purpose of this report is to show the overall characteristics and general trends of Japan's transfer of technology to developing countries."

Packenham, Robert A. *Liberal American and the Third World: Political Development Ideas in Foreign Aid and Social Sciences.* Princeton University Press, 1973. 395 p.

"A study of how assumptions embedded in the 'American liberal tradition' shaped the doctrines of U.S. officials and the theories of academic social scientists about the nature and goals of foreign aid. The author argues that both these sets of ideas were similar and usually inappropriate to conditions in the recipient countries." (1)

Peters, E. Bruce, and Daniel D. Roman. "The Transfer of Scientific and Technical Information to Developing Nations." *International Associations,* no. 11, Nov. 1973: 544-549.

Poats, Rutherford M. *Technology for Developing Nations, New Directions for U.S. Technical Assistance.* Washington, D.C., The Brookings Institution, 1972. 255 p.

The author builds an argument for a renewed commitment for U.S. technical assistance after reviewing some of the social effects of technological application and the opportunities and limitations surrounding technological attacks on key problems in each major sector—agriculture, industry, health, nutrition, population, and education. He suggests research priorities and methods in the light of successful examples in both bilateral and multinational development programs.

Rubenstein, Albert H., Theodore W. Schlie, and Alok K. Shakrabarti. *Research Priorities on Technology Transfer to Developing Countries, Vol. I.,* Evanston, Illinois, Northwestern University, January 1974, Northwestern Document No. 73/61. 122 p.

"Results of a workshop held to identify important, researchable questions in the area of technology transfer to developing countries, and to set priorities among them. A list of questions was produced along with a recommended approach to doing research in the technology transfer field. The document includes brief papers by researchers on various aspects of technology transfer and developing nations." Supported by NSF RANN award: GI–39239.

Seitz, Frederick and Robert W. Kitchen, "United States Urges Practical Approach in Applying Science and Technology to Development." *Dept. of State Bulletin*, v. 68, May 21, 1973: 661–669.

Speeches by 2 U.S. Representatives before the U.N. Economic and Social Council Advisory Committee on the Application of Science and Technology to Development.

Solo, Robert A. *Organizing Science for Technology Transfer in Economic Development*. East Lansing, Michigan State University Press, 1975. 219 p.

Focuses on policy considerations and problems in a technology-supplying country, especially four nations which are used for case studies: France, Great Britain, the Netherlands, and West Germany.

U.S. Agency for International Development. Office of Research and University Relations. *The A.I.D. Research Program, 1962–1971: Project Objectives and Results*. [Washington] 1971. 114 p.

Describes purposes, methodology and results of research projects in agriculture, health, nutrition, population, education, institutional and social development, industrial and urban development and economics, and provides information pertinent to the country where the project was performed.

U.S. Agency for International Development. Office of Science and Technology. *Science and Technology for International Development: A Selected List of Information Sources in the United States*. Springfield, Va., Distributed by NTIS, 1972. 49 p. PB–210–104.

". . . Presents a list of libraries and other organizations which have relatively complete and comprehensive holdings of publications pertaining to science and technology in developing countries."

U.S. Agency for International Development. *AID Research 1971–1973*. Washington, U.S. Govt. Print. Off., 1973. 97 p.

Summaries in nontechnical language of more than 80 projects in agriculture, health, education, nutrition, population, science and technology, and economics highlighting the nature, objectives and results of AID-financed research.

U.S. Agency for International Development. *Application of Modern Technologies to International Development*. A series. Washington, U.S. Govt. Print. Off.

Contains abstracts of research projects on the topic.

U.S. Congress. House. Committee on Foreign Affairs. *The Reorganization of U.S. Development Aid: Comparison and Summary Analysis of Some Official and Unofficial Proposals*. Prepared by the Foreign Affairs Division, Congressional Research Service, Library of Congress. May 1973. 93d Cong., 1st sess. Washington, U.S. Govt. Print. Off., 1973. 48 p.

"The purpose of this report is to present a tabular comparison and a brief summary analysis of various proposals made in recent years—including those of the President submitted to the 92nd Congress—to restructure the U.S. foreign aid program. Many of these proposals have been the work of official bodies appointed for the specific task of examining the aid program and making recommendations for its improvement, but a number have been advanced by international development specialists and private organizations."

U.S. Congress. House. Committee on Foreign Affairs. *The United States and the Multilateral Development Banks*. Prepared by the Foreign Affairs Division, Congressional Research Service, Library of Congress, March 1974. 93d Cong., 2d sess. Washington, U.S. Govt. Print. Off., 1974. 230 p. (Committee print.)

"Part I of this paper summarizes and compares the structure and operating procedures of the world and regional lending banks of which the United States is a member, and reviews briefly the operation of other international funding mechanisms—the regional and subregional banks to which the United States does not belong, consortia and consultative groups, and those programs of the International Monetary Fund which may be defined as development assistance. . . . Part 2 of the paper selectively discusses some of the implications of U.S. participation in the multilateral lending banks, exploring issues frequently raised in evaluating U.S. participation in and policy toward the banks. These include the responsiveness of member countries to the concept of burden sharing, the effects of the banks on the U.S. balance of payments, and the implications of U.S. participation in terms of both congressional

oversight and general foreign policy objectives. . . . The study [also] presents some of the problems which would be encountered in designing an evaluative comparison of the multilateral banks as well as an analytic comparison of their operations. In conclusion, the researchers offer several observations, highlighting problems which in their estimation have not received sufficient attention and suggesting items which deserve further consideration."

U.S. Congress. House. Committee on International Relations. *Implementation of "New Directions" in Development Assistance*, July 22, 1975, 94th Cong., 1st sess. Washington, U.S. Govt. Print. Off., 1975. 86 p.

"AID report on implementation of reforms included in the Foreign Assistance Act of 1975. Discusses policy and procedural issues and some of the difficulties involved in working with the new legislation." (3)

U.S. Congress. House. Committee on Foreign Affairs. Subcommittee on Africa. *Crisis of Development and Interdependence*. Hearings. 93d Cong. 2d sess. May, June, July 1973 and Feb. 1974. Washington, U.S. Govt. Print. Off., 1974. 410 p.

"Hearings to examine problems of African underdevelopment the extent of economic interdependence between the United States and Africa, and current U.S. policy."

U.S. Congress. House. Committee on Science and Astronautics. Subcommittee on International Cooperation in Science and Space. *International Science and Technology Transfer Act of 1974*. Hearings, 93d Cong., 2d sess. May 21, 22, 23, 1974. Washington, U. S. Govt. Print. Off., 1974. 172 p.

Regarding a proposal to establish a global telecommunications system to transfer technology.

U.S. Congress. Senate. Committee on Banking, Housing and Urban Affairs. *Study of International Housing; Reports from U.S. Agencies and International Organizations*. Washington, U.S. Govt. Print. Off., 1971. 454 p.

At head of title: 92d Cong., 1st sess. Committee print.

U.S. Congress. Senate. Committee on Foreign Relations. *Alternatives to Bilateral Economic Aid*. Prepared by the Foreign Affairs Division, Congressional Research Service, Library of Congress. June 18, 1973. 93d Cong., 1st sess. Washington, D.C., U.S. Govt. Print. Off., 1973. 53 p. (Committee print.)

This study "proceeds on the assumption that there is interest in Congress in maintaining a U.S. role in the development process free of the drawbacks and shortcomings that have so often been ascribed to bilateral aid. Bilateral aid has been under increasing critical fire in recent years, and has lost the support of many people who formerly favored it. This report analyzes the following alternatives to bilateral aid: one, multilateral assistance; two, rescheduling and reduction of debt servicing by the developing countries; three, preferential tariff arrangements for the developing countries; and four, the encouragement of private investment by American Nationals in the less developed countries."

U.S. Congress. Senate. Committee on Foreign Relations. *U.S. Contribution to IDA*, Hearings, 93d Cong., 2d sess. Mar. 21 and 22, 1974. Washington, U.S. Govt. Print. Off., 1974. 103 p.

Continuation of hearings to authorize funding to replenish the International Development Association.

U.S. Congress. Senate. Committee on Foreign Relations. *U.S. Participation in ADB and IDA*. Hearings, 93d Cong. 1st sess. Nov. 19, 1973. Washington, U.S. Govt. Print. Off., 1973. 69 p.

Hearings on bills to authorize U.S. contributions to the Asian Development Bank and the International Development Association.

U.S. General Accounting Office. *More Effective United States Participation Needed in World Bank and International Development Association, Department of the Treasury, Department of State, and Other Agencies;* report to the Congress by the Comptroller General of the United States. [Washington]. 1973. 85 p. B-161470 Feb. 14, 1973.

U.S. National Technical Information Service. *Application of Modern Technologies to International Development*. Washington, U.S. Agency for International Development, Office of Science and Technology [available from NTIS]. 1972. 74 p.

Contains research reports sponsored by the U.S. Government in three general subject areas: chemistry; materials; and mechanical, industrial, civil, and marine engineering. AID-OST-72-1.

Wade, Nicholas. "Third World: Science and Technology Contribute Feebly to Development." *Science*, v. 189, Sept. 5, 1975: 770-771, 774-776.

Discusses the "sad" state of affairs with science and technology in developing countries, and what the advanced countries can do about it.

White, John. *The Politics of Foreign Aid.* New York, St. Martin's Press, 1974. 316 p.

Opens by describing the purposes, procedures and justifications for the foreign aid program. Development should be viewed as a separate objective. However "Discussion of both have often been empty. Criteria of success or failure have commonly been artifical and unreal." All too often sentiment guides policy.

The author follows with a useful analysis of the various theories of developmental aid, both bilateral and multilateral. The politics of the aid programs are also examined with respect to both doner and recipient countries.

C. ISSUES RELATING TO A RECIPIENT NATION

Balasubramanyam, V. N. *International Transfer of Technology to India.* New York, Prager Publishers, 1973. 143 p.

"The study focuses on the Indo-foreign technical collaboration agreements. These agreements represent instruments of technological transfer in a relatively pure sense. [They] are of particular interest because of their arms-length nature. In contrast to joint ventures and direct foreign investment . . . they minimize the penetration of foreign interests and control into the less developed countries. This is a matter of no small importance to nations still in the shadow of yesterday's colonialism. . . ." The author's findings are not entirely positive. ". . . he suggests that the degree of lender involvement through asset ownership and managerial control or participation appears to be positively related to the success of transfer. Because the collaboration agreements offer minimal scope for such involvement, they may be much less effective than direct investment and joint ventures in bringing new methods to the less developed countries."

Baranson, Jack. "The Drive Toward Technological Self-Reliance in Developing Countries." Paper presented at the Conference on Latin American-U.S. Economic Interactions, University of Texas, March 1973. 21 p. Available from the State Dept. as FAR 21050-P.

Baranson, Jack. "Technical Improvement in Developing Countries." *Finance and Development,* v. 11, June 1974: 2–5.

"Industrial technology now supplied by multinational corporations to LDCs contributes inadequately to their sustained growth and development. But at the same time most LDCs lack indigenous design and engineering capabilities. Japan and the People's Republic of China have found ways out of this dilemma."

Barrett, Patrick J. "The Role of Patents in the Sale of Technology in Mexico." *American Journal of Comparative Law,* v. 22, spring 1974: 230–280.

Article discusses patent law in Mexico and its importance to a developing country.

Bykov, A.N., M.P. Strepetova, and A.V. Letenko, *Soviet Experience in Transfer of Technology to Industrially Less-developed Countries.* New York, United Nations Institute for Training and Research, 1973. 187 p. (Research report, no. 15.)

"The Cocoyoc Declaration." *International Organization,* v, 29, no. 3, Summer 1975: 893–902.

"On October 8, 1974, a special meeting was convened in Cocoyoc, Mexico, by two United Nations bodies charged with questions of technological and economic import, UNCTAD and UNEP. The meeting was composed of experts serving in their individual capacities, presided over by Lady Barbara Jackson. Since the purpose of the gathering was to discuss the implications of technologies destructive of the physical environment in terms of overall considerations of quality of life, economic development, social harmony, and international concord its conclusions speak directly to the issues addressed in this volume. These conclusions are among the first systematic attempts to state, under United Nations auspices, the connections between the issues of environmental protection and the redistribution of global economic and social resources. This article reprints the 'Cocoyoc Declaration' in its entirety."

Education and Science Development: Three Years of Inter-American Cooperation. Washington, D.C., General Secretariat, Organization of American States, April 1972. 48 p.

A summary of the positive achievements of a "common inter-American undertaking after three years of constant and sustained efforts." Limited to the regional programs in education, science, and technology.

Ganiere, Nicole. *Transfer of Technology and Appropriate Techniques: a Bibliography.* Paris, Organization for Economic Cooperation and Development, Non-dated, 86 p.

Bibliography, in accordance with the terminology adopted by the I.L.O. on technology transfer to the developing countries. The materials address: transfer process and diffusion of technology, the transfer of technology: case studies, the selection and adaptation of technology: appropriate techniques; and how to improve innovation possibilities and promote R. & D. in developing countries.

Hall, Douglas E. and Alan E. Dieffenbach, "Compensation of Foreign Advisers in Developing Countries." *International Development Review,* v. 15, no. 3, 1973, suppl.: 3–6.

"Advisers from developed countries are often overpaid, which can be detrimental to development goals."

Hollman, Stephen N. "Mexican Restrictions on Foreign Investments and Technology." *Practical Lawyer,* v. 20, Feb. 1974: 55–60.

Focuses on 2 Mexican laws enacted in 1973.

Lester, Jim. *Technology Transfer and Developing Countries: A Selected Bibliography. In* U.S. Congress. House. Committee on Science and Astronautics. Subcommittee on International Cooperation in Science and Space. *International Science and Technology Transfer Act of 1974.* Hearings, 93d Cong. 2d sess. May 1974. Washington, U.S. Govt. Print. Off., 1974. pp. 167–172.

Linowitz, Sol M. "The Future of the Americas." *Science,* v. 181, September 7, 1973: 916–920.

Adapted from address given at the Inter-American meeting Science and Man in the Americas, sponsored jointly by the American Association for the Advancement of Science and the Consejo Nacional de Ciencia y Technologia de Mexico, Mexico City, June 27, 1973. Addresses obstacles to and opportunities for development as well as the need for improved U.S. scientific and technological policies toward the Latin American nations.

Moravcsik, Michael J. *Science Development: Toward the Building of Science in Less Developed Countries.* A Publication of the Program of Advanced Studies in Institution Building and Technical Assistance Methodology of the Midwest Universities Consortium for International Activities. Bloomington, Indiana, Indiana University, 1974. 284 p.

Deals with the following aspects of the building of science in less developed countries: the rationale; education and science; manpower; scientific communications; scientific research; planning, policy, and management; international aspects; and future needs. A bibliography is included.

Myrdal, Gunnar "The Transfer of Technology to Underdeveloped Countries." *Scientific American,* v. 231, Sept. 1974: 172–178, 180–182.

"The elimination of mass poverty is necessary to supply the motivation for fertility control in such countries. Other countries should assist in this process, not least because they have a moral obligation to do so."

Nelson, Richard R. "Less Developed Countries—Technology Transfer and Adaptation: the Role of the Indigenous Science Community." *Economic Development and Cultural Change,* v. 23, Oct. 1974: 61–77.

Patel, Surendra J. "Transfer of Technology and the Third UNCTAD." *Journal of World Trade Law,* v. 7, Mar.–Apr. 1973: 226–239.

Argues that the resolution on the transfer of technology at the Santiago meeting of the Third UNCTAD could serve as a charter for improving the access of developing countries to technology.

Saito, Masaru. "Technology Transfer as a Development Strategy in the ECAFE Region." *Economic Bulletin for Asia and the Far East,* v. 25, June 1974: 33–41.

Discusses policies for modernization of the technology transfer mechanism and cooperation among Asian countries.

Science and Brasilian Development: Report of the Fourth Workshop on Contributions of Science and Technology to Development. November 1–5, 1971, Washington, D.C. Conducted by the Office of the Foreign Secretary, National Academy of Sciences, in Cooperation with National Research Council of Brazil. Washington, D.C., 1972. 87 p.

"Science and Man in the Americas." *Nature*, v. 244, July 13, 1973: 66–67.

"The American Association for the Advancement of Science and the newly-formed Mexican National Council on Science and Technology (Conacyt) jointly sponsored a meeting in Mexico City from June 20 to July 4 on the theme Science and Man in the Americas."

"Science, Technology, and Development: the Consensus of Brasilia." *Am*[illegible] v. 24, Oct. 1972: S1–S15.

This supplement was excerpted from the official OAS document reporting on the Brasilia Conference. "The primary purpose of the Specialized Conference on the Application of Science and Technology to Latin American Development (CACTAL) was to explore the interdependent relationships of science, technology, and development within the Latin American context. The Conference was held in Brasilia, Brazil, May 12–19, 1972."

Singer, H. W. "The Technology Gap and the Developing Countries." *International Journal of Environmental Studies*, v. 3, May 1972: 119–123.

"As the ability to analyse technical scientific and managerial problems has grown in the rich industrial countries, the poor, low-income countries have become increasingly dependent on technologies conceived and developed in the rich countries and not suitable for their needs and resource endowments. In the light of this situation, it is suggested that the rich-developed countries should reorient a substantial part of their expenditures on R. & D. so that some of the resulting advances in science and technology are directly geared to the problems of the less developed countries as pointed out in the U.N. World Plan of Action for the application of science and technology to development."

Sino-U.S. Workshop on Scientific and Technical Information Needs and Resources of the Republic of China (Taiwan), Washington, D.C., 1973. *Scientific and Technical Information Needs and Resources in the Republic of China (Taiwan): Report of a Sino-U.S. Workshop.* Washington, National Academy of Sciences, 1974. 77 p.

Jointly sponsored by Academia Sinica, Republic of China, and Board on Science and Technology for International Development, Commission on International Relations, National Academy of Sciences-National Research Council, United States of America. The purpose of the workshop was to identify the needs for scientific and technical information in Taiwan and resources required, to make recommendations for strengthening the information structure, and to identify areas for further U.S.-Chinese Nationalist cooperation.

Singer, Hans W. "Transfer of Technology in LDC's." *Intereconomics*, no. 1, Jan. 1974: 14–17.

Discusses the controversial problems connected with the transfer of highly sophisticated technologies to developing countries. Concludes that this transfer and adaptation of technologies is necessary and advantageous, but depends on the development of a national technological capacity of a developing country as a prerequisite.

Shapley, Deborah, "Science in Vietnam: The Postwar North Seeks American Assistance." *Science*, v. 189, Aug. 29, 1975: 705–707.

Report of a visit by Yale Prof. of biology Arthur W. Galston to North Vietnam in June 1975.

Thomson, David R. "Imported Technology and National Interests in Latin America." Case study prepared for the Sixteenth Session of the Senior Seminar in Foreign Policy, U.S. Dept. of State, 1973–1974. 29 p. Available from the State Dept. as FAR 19877-S.

Timmer, C.P., et. al. *The Choice of Technology in Developing Countries: Some Cautionary Tales.* Cambridge, Harvard University, Center for International Affairs, 1975. 112 p. (Harvard Studies in International Affairs, 32.)

"This book focuses on the problem of why development policies, which during the 1950s and 1960s were considered fairly successful in terms of bringing about an overall rate of growth in the GNP, failed for the most part in their articulated goal of bettering the lot of the bulk of the populations in underdeveloped countries or in lowering their rate of unemployment." Several case studies are included. These deal with Indonesia; irrigation tubewells in East Pakistan, management techniques in Indonesia, and petrochemical technology in Colombia. "All of these essays suggest that the bias against more labor-intensive usages has been fostered by managers and

policymakers in both developing and developed countries who have been enamored by high technology and have encouraged its adoption. The authors' message is that intermediate technology, using less capital and more of a country's labor may well be part of the answer to the unemployment problems of the developing countries."(2)

United Nations. *Appropriate Technology and Research for Industrial Development.* New York, United Nations, 1972. E. 72.II.A.3.

United Nations. *Organization, Management and Supervision of Public Enterprises in Developing Countries.* New York, United Nations, 1974. E.74.II.H.4.

United Nations. Secretary General (Waidheim). *Arrangements for Broadening the Experience of Young Specialists From Developing Countries in Other Countries in the Field of Natural Resources Exploration and Development.* [New York] 1972. 4 p. (United Nations. [Document] DP/L.252)

At head of title: United Nations Development Programme.

Vaitsos, Constantine V. "Strategic Choices in the Commercialization of Technology: the Point of View of Developing Countries." *International Social Sciences Journal,* v. 25. no. 3, 1973: 370–386.

"This article refers to some of the policy considerations arising from the actual mechanisms of technology purchase by developing countries within or outside the framework of direct foreign investment."

Yudelman, Montague, Gavan Butler, and Ranadev Banerji. *Technological Change in Agriculture and Employment in Developing Countries.* [Paris] Development Centre of the Organisation for Economic Co-operation and Development [1971] 204 p. (Organization for Economic Cooperation and Development. Development Centre. Development Centre Studies. Employment series, no. 4)

INTERNATIONAL TECHNOLOGY TRANSFER: THE DEVELOPED NATIONS

American Enterprise Institute for Public Policy Research. ***The Burke-Hartke Foreign Trade and Investment Proposal.*** **Washington [1973] 39 p. (American Enterprise Institute for Public Policy Research. Legislative analysis no. 4)**

American Federation of Labor and Congress of Industrial Organizations. Economic Policy Committee. "World Trade in the 1970s." ***American Federationist,*** **v. 80, Apr. 1973: 16–24.**

"The continuing deterioration of the U.S. position in world trade and the export of thousands of U.S. jobs has made the revision of U.S. trade policies one of the nation's most critical legislative needs. Among the developments bringing about the crisis are the spread of managed national economies in which foreign governments aid exports and penalize imports; the internationalization of technology; the skyrocketing rise of investments by U.S. companies in foreign subsidiaries; and the spread of U.S.-based multinational corporations."

Basiuk, Victor. "Future Technology and Western European Security." In Fox, William T. R. and Warner R. Schilling, eds. *European Security and the Atlantic System.* New York Columbia University Press, 1973. pp. 35–71.

"This chapter explores how Eastern Europe's security and viability as a region of major political significance will be affected by future technology. It describes three alternative 'technologically influenced' future Western Europes and discusses the variables that can bring them about. These alternative future Western Europes are then analyzed in the context of the American national interest and various possible policies for the United States are considered."

Callaghan, Thomas A. Jr. *U.S./European Economic Cooperation in Military and Civil Technology: an Issues-oriented Report.* Prepared by EX-IM Tech. Inc., Arlington, Va. for INR/XR, U.S. Dept. of State, August 1974. 97 p. Available from the State Dept. as FAR 20688–S.

Canada, Science, and International Affairs. Report of the Science Council of Canada. Report No. 20, April 1973. Ontario, Science Council of Canada. 66 p.

"This report is about the interaction of politics with Canada's participation in international scientific affairs. The focus is on science rather than technology. The problems identified are not amenable to a quick organizational fix, and so we make no cook-book recommendations. Attitudes must change before substantial progress can be made."

Recommendations are made for governmental and nongovernmental action.

Commission of the European Communities. "Objectives and Instruments of a Common Policy for Scientific and Technological Development." *Bulletin of the European Communities.* Supplement, June 1972. 58 p.

Proposals for joint cooperative research and policy formulation.

A Comparative Study of Science Advisory Approaches of Selected Developed Countries. Prepared for the Committee on Science and Astronautics, U.S. House of Representatives, by the Science and Technology Policy Office, Office of the Science Adviser, National Science Foundation, November 1974. *In* U.S. Congress. House. Committee on Science and Technology. *Federal Policy, Plans, and Organization for Science and Technology. Part II.* Hearings, 93d Cong., 2d sess. June and July 1974. Washington, U.S. Govt. Print. Off., 1974. pp. 570–613.

ECE Seminar on the Management of the Transfer of Technology Within Industrial Cooperation. Geneva, July 14–17, 1975. In press.

Among the papers presented by the United States delegation, are: "Laying the groundwork for international technology transfer," Lowell W. Steele; "East-West technology transfer—a case study of industrial cooperation," Angelo Leparulo; "Transfer of technology and East-West cooperative ventures," Robert D. Klages; "Technical information, technical assistance and technology transfer—the need for a synthesis," Albert H. Rubenstein;

"Manufacturing enterprise relationships in East-West technology/transfer: theoretical models and practical experiences," Henry R. Nau and Eric W. Hayden; "The management process for transfer and development of technology from the transnational enterprise," Harvey W. Wallender, III; "Mutual benefits in industrial cooperation," M. W. Duncan; "A Unique manufacturing joint-venture in the computer industry," Hugh Donaghue.

Factors Affecting the International Transfer of Technology Among Developed Countries. Report of the Panel on International Transfer of Technology. U.S. Department of Commerce, Washington, U.S. Govt. Print. Off., 1970. 48 p.

Addresses factors that should be reviewed when transfer is considered desirable. Includes: positive U.S. Government policies and practices, control programs of selected U.S. agencies, selected Western European controls, capital controls, procurement policies, tax policies, patents, business policies, social and labor policies, tariffs, international standards, and functions of multinational organizations.

Garnett, John. "The United States and Europe: Defence, Technology, and the Western Alliance." Review article *In International Affairs.* Published quarterly for the Royal Institute of International Affairs, Oxford University Press. April 1968, pp. 282–89.

"The study of international politics is focused on the political relations between independent sovereign states, and quite naturally, most of its students are drawn from the related discipline of history and political science. Unfortunately, students reared in these 'soft' subjects—and that is not a term of disparagement—are often reluctant to come to grips with developments in economics and technology, even when those subjects underpin and determine a good deal of international political relations. If ever there was a time when the student of international politics could get by with only a casual knowledge of what was happening in the fields . . . that time is past. Today, when so many defence and foreign policy decisions are taken almost entirely on the basis of economic and technological considerations, it is necessary for those whose interest lies in understanding those decisions to probe more deeply into literature far removed from historical documents and official records."

Mr. Garnett reviews these notions in his discussion of a series of six papers which "explore the nature of the technological relationship between Europe and the United States, and . . . show precisely how national defence arrangements have been complicated by technological developments."

Holsti, Kal J. and Thomas Allen Levy "Bilateral Institutions and Transgovernmental Relations Between Canada and the United States." *International Organization,* v. 28, Autumn 1974: 875–901.

Focuses "not only on the bilateral institutions but also on the phenomenon that Nye and Keohane have called transgovernmental relations, that is, the noninstitutionalized relationships between subunits of governments and the activities they undertake that remain reasonably immune from central control."

Klaiber, Wolfgang and Wayne H. Ferris. *The Emerging Industrial Policy of the European Economic Community: its Future Evolution and Impact on the Economic Interests of the United States.* Report prepared by the International Research Group, Washington, D.C., for INR/XR, U.S. Dept. of State, June 1974. Vol. I–26 p.; Vol. II–172 p. Available from the State Dept. as FAR 20525–S.

Kenward, Michael. "Technology Transferred." New Scientist, v. 59, July 5, 1973: 26–27.

"As a meeting in Paris this week and last showed, the emergence of technology transfer 'reveals a healthy realisation that science is not just a neutral tool for man's entertainment and comfort.' "

Kosobud, Richard. "The Role of International Transfer of Technology in Japan's Economic Growth." *Technological Forecasting and Social Change,* v. 5, 1973: 395–406.

The author's tentative conclusion is that Japan's rapid economic growth can be partly explained by economic policy and managing a large scale transfer of technology.

Long, T. Dixon. "Japanese Technology Policy: Achievements and Perspectives." *Research Policy,* v. 4, 1975: 2–26.

"The major thrust of national technology policy in Japan for over a century has been the effort to catch up with the industrial nations of Western Europe and North America. Technology policy today has two aspects: hardware, and organization. On the hardware side, Japan is the case par excellence of a nation whose policies acknowledge that technology with national security and defense implications is inseparable from that involved with economic growth, the R&D effort, and industrial innovation. The 'national interest technologies' that are important for Japan are nuclear energy, space research and development, aircraft, and computers. The pursuit of domestic capabilities in these technologies has been supported by new and strengthened organizations, especially with regard to industrial innovation, scientific and technological policy-making, and the acquisition and dissemination of information from abroad—'technological intelligence'. Based on these capabilities, Japan is nearing a potential for nuclear weapons and missile delivery systems, though it is not likely that she will choose to develop them. Rather, Japan is likely to be an increasingly strong competitor in nuclear and space-related technology such as power generators and space communications. The potential for original contributions in other fields of applied technology is also growing. Political factors at home and in the East Asian region suggest that these will occur in areas such as transportation and pollution control, technical assistance to developing economies, and resource exploitation—especially energy resources."

Lwinger, Thomas C. "The Technology Factor and the Export Performance of U.S. Manufacturing Industries." *Economic Inquiry*, v. 13, June 1975: 221–236.

Concludes that "U.S. comparative advantage is most pronounced in industries that are R&D intensive, giving the U.S. a temporary technological lead in exports of their products. U.S. competitive position in world markets is further enhanced through the effective use of its relatively abundant factor—highly skilled labor."

Maddox, John. "New Science Policy Tasks for the European Community." *Public Science*, January 1973: 4–6.

Discussion of functions, personalities, and institutions involved in establishing a coordinated science policy and joint research projects among the members of the EEC.

National Research Council. Computer Sciences and Engineering Board. Computer Technology/Resources Panel. *The Computer Industry in Japan and its Meaning for the United States.* [Washington, Distributed by NTIS, 1973] 130 p. (PB-220-000.)

Nau, Henry R. "A Political Interpretation of the Technology Gap Dispute." *Orbis*, v. 15, summer 1971: 507–527.

". . . The purpose of this essay is to show that U.S.-European differences, whether manifested in trade, monetary, strategic or technological disputes, have common roots in a growing divergence of broader political interests between the United States and its West European allies. . . . This is evident in the treatment of the technology gap dispute."

Nau, Henry R. "Collective Responses to R and D Problems in Western Europe: 1955–1958 and 1968–1973." *International Organization*, v. 29, no. 3, Summer 1975: 617–654.

"Collective responses to technology-related international problems may differ in terms of organizational outcomes (new, modified, or no organizations). Some of this difference may be accounted for by contrasting objectives and capabilities of major actors. Actors may emphasize different dimensions of the policy setting, possess varying amounts of resources and information to affect that setting, and accordingly prefer alternative responses. Possibilities of this sort are examined empirically in two separate, chronological periods of Western European responses to collective R&D problems. In the first period, major actors stressed different dimensions of the policy setting, possessed unequal resources, and responded to the situation by the creation of new organizations (Euratom and ENEA); in the second, they stressed the same dimensions of the policy setting, possessed roughly equal capabilities, and decidedly resisted the creation of new organizations. The different outcomes suggest that stratification of perceptions and capabilities, emphasizing complementarity, may be more conducive to organizational creativity than similarity of perceptions and capabilities, emphasizing competition."

Nau, Henry R. "R and D Issues in Western Europe: Perceptions, Capabilities and Responses." Paper presented at the annual meeting of the American Political Science Assoc., Chicago, August–September 1974. 36 p. Available from the State Dept. as FAR 20586–P.

"The Need for European Co-operation in Research." Organisation for Economic Co-operation and Development, Paris, France, *Science Policy Information* 3, no. 22913, October 1967: 42–44.

" 'At the Annual Meeting of the Max Planck Society in June 1967 Professor Adolf Butenandt, in his presidential address, discussed international co-operation in scientific research and technology and its implications for the organisation of research in the Federal Republic.' Topics included: the rising costs of research and the political considerations and measures needed: the relative strengths in R. & D. of the U.S. and the Common Market countries and the bases for the favorable U.S. position; European scientific cooperation as necessary to keep pace with the U.S.; loosening of present funding procedures from the current 1:1 ratio between the Federal and 'Lander' governments (otherwise scientific progress would be determined by the financially weaker 'party')." (4)

"New Commerce Office to Study World Technology Trends." *Science and Government*, June 15, 1973: 7.

Describes creation of a new office of Technology Assessment and Forecast, among whose functions would be to gather and assess data regarding international technology transfer.

Nichols, George C., et al. *Technology Enhancement Programs in Five Foreign Countries.* Report prepared by the Office of the Assistant Secretary for Science and Technology, U.S. Dept. of Commerce. Washington, U.S. Govt. Print. Off., 1972. 334 p. Available from NTIS, Report No. COM 72-11412.

"Competition among nations to penetrate foreign markets for their industrial products has led the governments of most of the advanced countries of the world to use a variety of technology enhancement mechanisms and programs. The purpose of these programs is to stimulate invention and innovation and the development, transfer, and application of new technologies through the use of subsidies, tax, and other incentives, government procurement, joint ventures, R and D investment in designated industrial sectors, low and no-interest loans, and other mechanisms in collaboration with the private sector. This report examines the major technology enhancement programs initiated in recent years by Canada, France, Germany (Federal Republic), Japan, and the United Kingdom. The experience of these countries with such programs is of interest to the United States at this time particularly in relation to the newly-initiated Experimental Incentives Program that is being implemented by the National Bureau of Standards . . . and the National Science Foundation. In addition to the technology enhancement programs, the report contains a discussion of the involvement in each country within which science and technology is developed and implemented and the government-private sector interaction. A bibliography is included at the end of each country's section."

Organisation for Economic Co-operation and Development. *Reviews of National Science policy.* Series [of separate books.] Paris, Organisation for Economic Co-operation and Development.

These comprehensive book length studies treat: Japan, 1967, 248 p.; Italy, 1969, 212 p.; United States, 1969, 550 p.; Canada, 1969, 456 p.; Norway, 1971, 196 p.; Austria, 1971, 196 p.; Spain, 1971, 126 p.; Switzerland, 1972, 256 p.; France, 1966, 133 p.; Iceland, 1972, 159 p.; Netherlands, 1973, 375 p.; and Ireland, 1975, 132 p.

Ozawa, Terutomo. *Japan's Technological Challenge to the West, 1950–1974: Motivation and Accomplishment.* Cambridge, MIT Press, 1974. 162 p.

"In this thoroughly documented analysis, the author finds the key to Japanese economic dynamism in two factors: the applicability of the Schumpeterian model of development, where innovation stimulates growth, and the intensity of the national need to catch and surpass the West." (1)

Pavitt, Keith. "Technology in Europe's Future." *Research Policy*, v. 1, 1971/1972: 210–273.

"European fears in the 1960s of U.S. technological domination have proved to be unfounded. The continuing U.S. lead in aerospace and defense technology has not spread to other sectors. European companies and governments have steadily upgraded their capabilities in civilian science and technology. However hopes that the 'imperatives of modern technology' would stimulate closer European integration have been disappointed." There are imperfections in integrating European research, technological research, and production sectors. The author reviews economic, political, and technological requirements for such integration. He also discusses the implications for the United States of such integration and concludes: "It would . . . be an *illusion* to expect the USA, in spite of its professed policy of encouraging European integration, to be happy about some of the consequences of technological integration."

Pavitt, Keith. "Technology, International Competition, and Economic Growth: Some Lessons and Perspectives." *World Politics*, v. 25, 1973: 183–204.

Concentrates "on how the growth of civilian science and technology has interacted with national policies and international relations in the 1960s and on what lessons for the 1970s can be drawn from the experiences of various countries." Focuses on the need for R and D investment to confront the issue, relevant to developing countries, of developing labor-using, not only labor-saving, production methods.

Puchala, Donald J. "Domestic Politics and Regional Harmonization in the European Communities." *World Politics*, v. 27, July 1975: 496–520.

"Case studies of national attempts to implement EEC directives in the field of regional aid, pharmaceutical marketing, investment control, and fiscal harmonization point up important interplays between regional harmonization and domestic politics. Evidence concerning the politics of regional implementation shows that the ability of an integration depends fundamentally upon its government's ability to act politically in its domestic arena."

The Research System, Vol. I: France, Germany, United Kingdom. Comparative Study of the Organisation and Financing of Fundamental Research, by G. Caty, G. Drilhon, G. Ferne, and S. Wald, under the direction of J.-J. Salomon. Paris, Organisation for Economic Cooperation and Development, 1972. 258 p.

"Study of the organization and financing of fundamental research which identifies and analyzes the following problems raised by scientific research in France, Germany, and the United Kingdom: decisionmaking at government levels, university and industry. This very detailed analysis defines scientific research as part of a system in which fundamental research cannot be disassociated from other kinds of research: nor can it be dissociated from the social demands. This multidisciplinary study describes the institutional and structural obstacles to the development of fundamental research and the exploitation of its results."

The Research System, Vol. II: Belgium, Netherlands, Norway, Sweden, and Switzerland. Comparative Survey of the Organization and Financing of Fundamental Research, by G. Caty, G. Drilhon, R. Enoch, G. Ferne, M. Flory, and S. Wald, under the direction of J.-J. Salomon. Paris, Organisation for Economic Co-operation and Development, 1973. 195 p.

Continuation of the series which looks at the following dimensions of research in the countries studied: national traditions and research policies in relation to international cooperation, university and research in a teaching oriented environment, research in the government sector, and the place of industry, science, the university, and the foundations in the research system.

The Research System, Vol. III: Canada, United States, General Conclusions: Comparative Study of the Organization and Financing of Fundamental Research. By G. Caty, G. Drilhon, G. Ferne, N. Kaplan, and S. Wald under the direction of J.-J. Salomon. Paris, Organisation for Economic Co-operation and Development, March 1975. 226 p.

Ritchie-Calder, Lord. "Scientists in the British Government—a Memoir." *Center Magazine*. v. 7, Mar.-Apr. 1975: 52–60.

Concern of a scientist about the whole question of ethics and the scientist's responsibilities to mankind in a technological world.

"Science in Europe: Poor Outlook for European Collaboration." *Nature*, v. 243, May 18, 1973: 123–145.

Collection of ten articles on science in Europe dealing specifically with cooperation, space, computers, manpower, and national situation reports for Ireland, France, the Netherlands, Germany, and Spain.

Science Policies of Industrial Nations: Case Studies of the United States, Soviet Union, United Kingdom, France, Japan, and Sweden. New York, Praeger Publishers, 1975. 233 p.

This is an anthology of analytical essays. It includes: "Science policy institutions in six countries," T. Dixon Long and Christopher Wright; "The Development of science policy in the Soviet Union," Loren R. Graham;

"Politics for science and technology in Great Britain: postwar development and reassessment," Norman J. Vig; "Science, technology and French independence," Robet G. Gilpin Jr.; "The Dynamics of Japanese science policy," T. Dixon Long; "Science and technology policy is in Sweden," Ingemar N. H. Dorfer; and "United States science policy in transition," Jurgen Schmandt.

Segal, Gerald. "Euroscience: Dahrendorf's Adagio." *New Scientist*, August 2, 1973: 267–268.

Background on Ralf Dahrendorf's appointment as EEC Commissioner for research, science and education and how it has led to a rethinking of the hardline Spinelli policies for a Community science and technology policy.

Tilton, John E. *International Diffusion of Technology: the Case of Semiconductors.* Washington, D.C., The Brookings Institution, 1972. 225 p.

"A few advanced countries, in particular the United States, create a large share of the world's new technology. From these innovation centers, new products and processes are disseminated throughout the world. This study investigates the international diffusion of transistor, integrated circuit, and other semiconductor technology in five countries—the United States, Britain, France, Germany, and Japan."

U.S. Congress. House. Committee on Foreign Affairs. *To Restore Harmony: New Efforts on Transatlantic Cooperation,* Washington, 1973. Washington, U.S. Govt. Print. Off., 1973. 75 p.

(At head of title: 93rd Cong. 1st sess. House Committee Print.)

Among the issues treated are energy, international trade in agricultural commodities, and multinational corporations.

U.S. Congress. Joint Economic Committee. Subcommittee on Economic Growth. *Technology, Economic Growth, and International Competitiveness.* A report prepared by Robert Gilpin. July 9, 1975. 94th Cong., 1st sess. Washington, U.S. Govt. Print. Off., 1975. 87 p. (Joint Committee Print.)

"Professor Gilpin examines the thesis that the United States has lagged in recent years in the development and application of new civilian technology because, among other things, of a faulty conception of the innovative process by Federal policymakers, an inappropriate allocation of Federal R and D funds, and a lack of adequate communication and coordination between research scientists and those in charge of industrial applications. The experiences of other industrial countries also are brought to bear on the issue."

U.S. Congress. Senate. Committee on Aeronautical and Space Sciences. *Meeting with Assembly of Western European Union, Committee on Scientific, Technological, and Aerospace Questions.* Hearing, 94th Cong., 1st sess. Mar. 18 and 20, 1975. Washington, U.S. Govt. Print. Off., 1975. 44 p.

International cooperation in astronautics/Space policy—[U.S.]/Space policy—[Western Europe].

U.S. European Economic Cooperation in Military and Civil Technology. 1974. National Technical Information Service, Department of Commerce. AD A009049.

The study was prepared in late summer 1974 by EX-IM TECH, Inc. for the Department of State, with funding from several military research agencies. "It assessed the costs in military and economic terms of duplication and lack of standardization in NATO's military procedure, analyzed the obstacles to eliminating these costs, and set forth a comprehensive plan to remedy the situation. The solution to the problem, [the author concluded] lies in establishing a Common Defense Market wherein every defense dollar Europe spends in the United States is matched over the long run with a dollar spent in Europe, and where there is an agency for the European NATO countries collectively to carry out nonduplicative bilateral defense industry programs with the United States."

U.S. General Accounting Office. *Benefits and Drawbacks of U.S. Participation in Military Cooperative Research and Development Programs with Allied Countries,* Department of Defense; report to the Congress by the Comptroller General of the United States. [Washington] 1974. 42 p. "B-167034, June 4, 1974"

Walsh, John. "In a Hard Year in Brussels, Things Look Up for Science." *Science,* v. 184, May 31, 1974: 962–967.

"One sector in which the [EEC] seems to be going forward is science and technology. This is perhaps surprising since the Community's science program has for years been stymied by the problems of Euratom, the Community's atomic energy organization. If there was a milestone marking a change in the fortunes of science and technology, it was the first Community summit meeting attended by the new member countries in the autumn of 1972. At this meeting the Community prime ministers gave a new high priority to science and technology in the Community context. Last year, Euratom was granted a 4-year budget after stumbling along on stopgap 1-year budgets since 1968, and a reorganization of the agency was decreed. The energy crisis gave impetus to energy R and D within the Community framework. . . . [This article] is an account of the first small steps toward development of a genuine European science policy."

Williams, Roger. *European Technology: the Politics of Collaboration.* New York, John Wiley and Sons, 1973. 214 pp.

An interesting and useful in-depth analysis of the major nationalistic obstacles to technological cooperation even among countries which are predisposed toward cooperation. Among the cases treated are those of the aircraft industry, space, nuclear research, and computers.

MULTINATIONAL CORPORATIONS

Aronson, Jonathan David. "The Multinational Corporation, the Nation-State, and the International System: a Bibliography." *Current Bibliography on African Affairs*, v. 7, Fall 1975: 378–436.

International corporations—Bibliography.

Barnet, Richard J. and Ronald E. Muller. *Global Reach: The Power of the Multinational Corporations*. New York, Simon and Schuster, 1974. 508 p.

Gives in great detail a negative assessment the impacts of American commercial investment in developing countries.

Carroll, M. B. *U.N. Proposals for the Regulation of Transnational Corporations*. New York, Presidents Association of the American Management Associations, 1975. 48 p.

Casey, William L., Jr. "U.S. Multinational Firms and the Exportation of U.S. Jobs, Capital, and Technology." *Atlanta Economic Review*, v. 23, Sept.-Oct 1973: 22–25.

Discusses the complexities and ambiguities of the issues that have emerged from recent congressional hearings and other public debates on those aspects of the Burke-Hartke bill relating to multinational firm operations.

Chudson, Walter A., *The Acquisition of Technology from Multinational Corporations by Developing Countries*. New York, United Nations, 1974. 50 p. (United Nations. [Document] ST/ESA/12) At head of title: Department of Economic and Social Affairs. "United Nations publication. Sales No. E.74.II.A.7"

Courtney, William H. and Danny M. Leipzinger. "Multinational Corporations in LDCs, the Choice of Technology." Paper prepared for INR, Dept. of State, Oct. 1973, 20 p. Available from the State Dept. as FAR 20069–S.

Duerr, Michael G. *R and D in the Multinational Company: A Survey*. New York, The Conference Board, 1970. 77 p. (Managing International Business, No. 8.)

Analysis of survey of senior international executives describing ". . . where their companies conduct research; how the international R and D function is organized and coordinated; how R and D funds are allocated to support international operations; and how the costs are recovered."

Eqea, Alejandro Nadal. "Multinational Corporations in the Operation and Ideology of International Transfer of Technology." *Studies in Comparative International Development*, v. 10, Spring 1975: 11–29.

"The analysis presented here will examine briefly the implications of the operations of transfer of technology for the global strategy of a multinational corporation as well as the attitude of multinational firms toward indigenous scientific and technological development of undeveloped countries."

Flanigan, Peter M. "The Multinational Corporation." *Dept. of State Bulletin*, v. 68, Mar. 26, 1973: 359–365.

"A statement made before the Subcommittee on International Trade of the Senate Committee on Finance on February 26 by [an] Assistant to the President and Executive Director of the Council on International Economic Policy."

Gillette, Robert. "Latin America: Is Imported Technology Too Expensive?" *Science*, v. 181, July 6, 1973: 41–44.

Discusses the growing concern in Latin America toward what are considered the excessive costs of imported technology and the role of multinational corporations.

Goldfinger, Nat. "The Case for Hartke-Burke." *Columbia Journal of World Business*, v. 8, Spring 1973: 22–26.

The growth of multinational corporations has resulted in a fundamental change in America's role in the world economy. Concomitantly, the nature of the U.S. economy is being altered. The author sees this as a net negative change in both of these respects. The Hartke-Burke bill is offered as a specific remedy to this situation of net balance-of-payments deterioration, loss of technological advantage and an eroding of the diversity of the U.S. industrial base.

Keohane Robert O. and Van Doorn Ooms. "The Multinational Firm and International Regulation." In "World Politics and International Economics," edited by C. Fred Bergsten and Lawrence B. Krause. *International Organization*, v. 29, No. 1, Winter 1975: 169–212.

Kindleberger, Charles P., ed. *The International Corporation: a Symposium*. Cambridge, Mass., M.I.T. Press [1970] 415 p.

Partial contents.—A theory of direct foreign investment, by R. Aliber.—The efficiency and welfare implications of the international corporation, by H. Johnson.—Multinational corporations and international oligopoly: the non-American challenge, by S. Hymer, and R. Rowthorn.—Technology, United States investment, and European economic growth, by J. Dunning.—The international firm and the national jurisdiction, by S. Rubin.—The multinational corporation in world petroleum, by M. Adelman.—Australia as host to the international corporation, by D. Brash.

Mason, R. Hal., "The Multinational Firm and the Cost of Technology to Developing Countries." *California Management Review*, v. 15, Summer 1973: 5–13.

Points out that multinational firms are often accused of making excessive profits, charging excessive fees for technology and not providing enough training or high-level jobs for nationals. The author presents a comparative analysis, using data from Latin America to represent developing countries and Europe and Canada to represent advanced countries, that does not support these criticisms.

Muller, Ronald; Raymond, Vernon, and Richard J. Barnet "(More) on Multinationals." *Foreign Policy*, No. 13, Winter 1973–1974: 70–122.

Continuation of a debate in the fall 1973 issue. Muller, in "Poverty is the product," presents a radical critique based primarily on Latin America and research for a forthcoming book; Vernon gives a measured response to both sides in the debate; and Barnet offers a comment on Vernon.

Negandhi, Anant R. and S. Benjamin Prasad. *The Frightening Angels: A Study of U.S. Multinationals in Developing Nations*. Kent, The Kent State University Press, 1974–1975. 249 p.

"The objectives of this book are: (1) to compare the management practices of American subsidiaries with those of local business firms in five developing countries; (2) to examine the implications of such comparisons with respect to management theory; (3) to study the contributions made by U.S. multinationals to the host countries and to identify some of the conflicting issues between the multinationals and the developing countries . . . The book is based on the findings of a study (largely interviews) of 47 U.S. subsidiaries and 45 comparable local firms in Argentina . . .; Brazil . . .; India . . .; Philippines . . .; and Uruguay. . . . In general the authors find that American subsidiaries are operated and managed at a more advanced and successful level than local firms. . . . On the impact of American firms the authors find that, while the U.S. subsidiaries are using advanced management practices, there is very little diffusion into local enterprises. There has been very little mobility of executive and supervisory personnel between the U.S. subsidiaries and the local firms. The authors suggest that the U.S. multinationals should play a larger role than they have in developing high-managerial personnel as well as technology in the host countries as the latter have so demanded." (2)

Penrose, Edith. "International Patenting and the Less-developed Countries." *Economic Journal*, v. 83, Sept. 1973: 768–786.

"The cost to non-industrial countries of acceding to the [international patent] Convention and accepting its provisions regarding patents on inventions which are patented and primarily worked abroad may be considerable. We must now examine the nature of these costs as well as the nature of the benefits. . . ."

Steele, R. D. *Multinational Corporations, Technology Transfer, and the Developing Countries: an Introductory Bibliography*. Monticello, Ill., 1975. 39 p. (Council of Planning Librarians. Exchange bibliography 745)

Sutter, Rolf. "Multinational Corporations: Technology Transfer into LDCs." *Intereconomics*, no. 12, Dec. 1974: 380–384.

"Multinational enterprises play an important role in the transfer of technology into LDCs. The article examines the various aspects of the transfer of technology and the attitude of multinational enterprises towards such transfers."

U.S. Congress. House. Committee on Foreign Affairs. *The Multinationals: Their Function and Future: Washington, 1974.* Report on the Sixth Meeting of Members of Congress and of the European Parliament, September 1974. 93d Cong. 2d sess. Washington, U.S. Govt. Print. Off., 1974. 139 p. (Committee print.)

"Report on a visit to Washington by an official delegation of the European Parliament. Includes meeting agenda, list of participants, summaries of discussion sessions, and texts of conference papers regarding U.S.-European economic and political relations. [Also includes a joint U.S.-European report on] the goals and behavior of multinational corporations and [exploration of] various international approaches to effective regulation of global business activities." (3)

U.S. Congress. House. Committee on International Relations. *The Multinationals: the View from Europe—Munich: 1975: Report of the Seventh Meeting of Members of Congress and of the European Parliament,* April 1975 pursuant to H. Res. 315. Washington, U.S. Govt. Print. Off., 1975. 130 p.

At head of title: 94th Cong., 1st sess. Committee print.

International corporations/International economic relations/International relations/International monetary system/Foreign economic relations—[U.S.]—EEC countries/Foreign economic relations—[EEC countries]—U.S.

U.S. Congress. Senate. Committee on Foreign Relations. Subcommittee on Multinational Corporations. *Multinational Corporations and U.S. Foreign Policy,* Part 3. Hearings, 93d Cong. 1st sess. July 18-20, 30, 31 and Aug. 1, 1973. Washington, U.S. Govt. Print. Off., 1973. 651 p.

This is part of the series of hearings on multinational corporations and foreign policy. This session was devoted to review of the Overseas Private Investment Corp. (OPIC) management and investment guarantee programs for U.S. companies operating in developing nations. Testimony was also taken on extending the OPIC program through the fiscal year 1976.

U.S. Congress. Senate. Committee on Foreign Relations. Subcommittee on Multinational Corporations. *Multinational Corporations and United States Foreign Policy.* Hearings, 93d Cong., 2d sess. Part 10. Washington, U.S. Govt. Print. Off., 1975. 405 p.

Hearings held June 17 . . . July 22, 1974. International corporations/Foreign relations—[U.S.].

U.S. International Firms and R, D and E in Developing Countries. A report of an Ad Hoc Panel of the Board on Science and Technology for International Development with the collaboration of the National Academy of Engineering, Office of the Foreign Secretary. Washington, D.C., National Academy of Sciences, 1973. 73 p.

Focuses on general issues related to the role of multinational firms in advancing national development objectives, as well as specific issues relating to U.S. firms operating in foreign countries. Discusses the potential for strengthening indigenous research, development, and engineering capabilities. Includes view from five firms, as well as conclusions and recommendations.

U.S. Tariff Commission. *Implications of Multinational Firms for World Trade and Investment and for U.S. Trade and Labor: Report to the Committee on Finance of the United States Senate and its Subcommittee on International Trade on Investigation No. 332-69,* under section 332 of the Tariff Act of 1930. Washington, U.S. Govt. Print. Off., 1973. 930 p.

Partial contents.—Summary of the findings of the study.—Impact of the multinational firm on the U.S. and foreign balances of payments.—The multinational firms in world trade.—Impact of the multinational firm on world patterns of investment.—Multinational firms in international finance.—Technology, R&D, and the multinational firm.—Impact of the multinational firm on labor in the United States and abroad.

At head of title: 93d Cong., 1st sess. Committee print.

United Nations. *The Acquisition of Technology from Multinational Corporations by Developing Countries.* New York, United Nations. 1974. E.74.II.A.7.

United Nations. *The Impact of Multinational Corporations on Development and on International Relations.* New York, United Nations, 1974. E.74.II.A.5.

United Nations. *Multinational Corporations in the World Development.* New York, United Nations, 1973. E.73.II.A.11.

United Nations. Secretary-General (Waldheim). "Draft Programme of Work on the Full Range of Issues Relating to Transnational Corporations; Report." [New York] 1975. 2 v. (United Nations. [Document] E/C. 10/2)

United Nations. [Document] E/C. 10/2/Add. 1.

At head of title: United Nations Economic and Social Council.

Includes addendum entitled "Development of a comprehensive information system."

United Nations. Secretary-General (Waldheim). "The Impact of Transnational Corporations on the Development Process and on International Relations; Views of States on the Report of the Group of Eminent Persons." [New York] 1974. 9 p. (United Nations. [Document] E/5595) International corporations/International relations/Economic development.

United Nations. *Summary of the Hearings before the Group of Eminent Persons to Study the Impact of Multinational Corporations on Development and on International Relations.* New York, United Nations, 1974. E. 74.II.A.9.

United States. *Transnational Corporations. A Select Bibliography.* New York, United Nations, 1974. E/F.75.I.5.

VanDam, Andre. "The Multinational Corporation vis-a-vis Societies in Transformation: the Case for Intermediate Technology in the Developing Countries." *Technological Forecasting and Social Change,* no. 5, 1973: 281–293.

Gives examples of labor intensive technology used by multinationals in developing countries and argues that more should be done in this direction, since "unemployment is really the greatest socioeconomic plague of the third world."

THE BRAIN DRAIN

Dublin, Thomas D. "Foreign Physicians: Their Impact on U.S. Health Care." *Science*, v. 185, August 2, 1974: 407–414.

The author, with the office of the Director, Bureau of Health Resources Development, Health Resources Administration, U.S. Department of Health, Education, and Welfare, notes that international migration aids domestic supply but raises issues of quality.

Glaser, William A. "UNITAR's Project on the Brain Drain and Study Abroad. Focus: Technical Cooperation, 1974/2, 26–27." Supported by NSF. USC/FAR Proj. No. 1679–73. Available from the State Dept. as FAR 22389–P.

Glaser, William A. "UNITAR's Project on the Brain Drain and Study Abroad. Focus: Technical Cooperation." Special insert in *The International Development Review*, v. 16, no. 2, 1974.

Glaser, William, A. Habers, and G. Christopher. "The Migration and Return of Professionals." *International Review*, v. 8, Summer 1974: 227–244.

Describes UNITAR's study on the brain drain.

Halle, Miguel. "Paying Lip Service." *Ceres*, no. 41, September-October 1974: 39–41.

The author argues that it is superfluous to complain about the brain drain as long as governments are not ready to meet the needs of scientists.

Henderson, Gregory. *Emigration of Highly Skilled Manpower From the Developing Countries*. New York, United Nations Institute for Research and Training, 1970. 213 p. (UNITAR research report No. 3.)

Sharma, Prakash C. *Migration and Brain Drain: a Selected Research Bibliography: Part 1, 1925–1965; Part 2: 1966–1973*. University of North Alabama (mimeo), 1974. 19 p. [I.D. no. 664.] Available from: Council of Planning Librarians, Exchange Bibliographies, P.O. Box 229, Monticello, Illinois.

Thomas, Brinley. "The Dynamics of Brain Drain." In *Migration and Economic Growth*. Cambridge University Press, 1973. pp. 306–329.

United Nations Educational, Scientific and Cultural Organization. *Scientists Abroad: Study of the International Movement of Persons in Science and Technology*. Paris, UNESCO, 1971. 147 p.

"A study of the international movement of persons in science and technology. Attempts to trace the international movement of scientists, engineers, and technicians, and to assess the relationship of this travel to national development. Contains suggestions for both short-and-long-term solutions to the problems posed."

United Nations. Secretary-General (Waldheim). *Outflow of Trained Personnel From Developing to Developed Countries*. Report New York, 1974. 26 p. Document E/C.8/21, United Nations Economic and Social Council.

Wilson, James. A. and Jerry Gaston. "Reflux from the 'Brain Drain.'" *Minerva*, v. 12, October 1974: 459–468.

A discussion based on a survey of British scientists who had emigrated to North America. It explores the motivations of those who had returned to Great Britain by 1968 and those who stayed abroad.

ENERGY

A. General Issues

"An International Solar Energy Development Decade: a Proposal for Global Cooperation." *Bulletin of the Atomic Scientists*, v. 28, May 1972: 31–34.

The Atlantic Community Quarterly, v. 13, no. 1, Spring 1975. (Special issue on energy.) Includes: "Energy: The Necessity of Decision, " Henry A. Kissinger; "Reports of the Atlantic Council's Energy Policy Committees: "Chairman's Forward": 23–25; "World Energy and U.S. Leadership," Harlan Cleveland, 26–45; "A Call for Leadership," E. Keith Thomson and Richard R. Harbert, 46–56; and "Financing Free World Energy Supply and Use," John E. Gray, 57–93.

Blaney, Barry C., "The Energy Crisis: Challenge to the International System." *World Affairs*, v. 136, Winter 1973–1974: 195–207.

"A broader perspective on the international implications of the world 'energy crisis' indicates that the world community must create new and better institutions to deal with the problems of growth and the advance of technology."

Buchanan, John E., *World Energy Market Projections*. Report, GC–A–427–74–094. Prepared for the Federal Energy Administration, September 1974. 93 p. USC/FAR Proj. No. 29005–74. Available from the State Dept. as FAR 21673–G.

Choucri, Nazli. and Vincent Ferraro. "Analyzing Global Interdependence: Vol. II—Energy Interdependence." Report, C174–28, prepared for INR/XR, U.S. Dept. of State, by Center for International Studies, Massachusetts Institute of Technology, November 1974, 192 p. USC/FAR Proj. No. 24002–73. Available from the State Dept. as FAR 21164–S. Part of the larger series analyzing global interdependence, under the director of Lincoln P. Bloomfield.

DeCarmoy, Guy, and others. "Cooperative Approaches to World Energy Problems: a Tripartite Report by Fifteen Experts From the European Community, Japan, and North America." Washington, Brookings Institution [c1974] 51 p.

Reports on the results of a meeting of experts held in Brussels, March 25–29, 1974.

Erickson, Edward W. and Leonard Waverman, eds. *The Energy Question: an International Failure of Policy. V. 1: the World. V. 2: North America*. Toronto, University of Toronto Press, 1974. 2 v.

". . . A remarkably rich set of papers (mostly on economics and technology) . . . tied together with helpful commentaries." (1)

Ehrhardt, Carl A. "Europe and Energy Policy at Top Level." *Aussenpolitik*, v. 26, no. 1, 1975: 3–18.

Concerns the efforts of the EEC countries to ban together for common energy goals, their strong differences, and the roles that OECD countries and the International Energy Agency have assumed as a result.

Feld, Bernard T. *Disarmament, Energy Problems, and International Collaboration*. Proceedings of the Twenty-fourth Pugwash Conference on Science and World Affairs, Baden, Austria, August–September 1974. 492 p. Available from the State Dept. as FAR 22053-P.

Hardesty, C. Howard, Jr. "The U.S. Energy Situation, and Its International Implications." *Natural Resources Lawyer*, v. 7, Fall 1974: 569–580.

Provides a brief history of the recent energy crisis, a summary of the options available to the U.S. and the world to solve the problems in the future, and a list of steps to be taken immediately to solve the problems.

Horelick, Arnold L. "The Soviet Union, The Middle East, and the Evolving World Energy Situation." *Policy Sciences*, v. 6, March 1975: 41–48.

"Surveying and summarizing the basic issues confronting Soviet decision-makers in the next ten years as reflected in energy and international political terms, this analysis treats the capacity and constraints mediating Soviet influence in the resolution of the future world energy balance. A scenario highlighting a "Soviet-Preferred Future World" is developed that focuses on three classes of likely energy outcomes: (1) a gradual erosion of the Western commercial position in Middle East oil, (2) repeated shortages in oil-consumer states leading to a diversion of attention away from international matters and increased preoccupation with "domestic" energy woes, and (3) a deterioration of the terms of trade for energy importers *vis à vis* Soviet and noncommunist trading partners. The discussion concludes with an assessment of several of the key choices confronting the major oil-importing nations and requiring resolution."

Hunter, Robert E. *The Energy Crisis and U.S. Foreign Policy*. New York, Foreign Policy Association, 1973. 79 p. (Headlines series no. 216.)

International Research Group. *Energy Policies in the European Community*. [Washington, U.S. Energy Research and Development Administration, available from NTIS] 1975. 1 v. (various pagings) "ERDA-51"

"Examines the political, economic, and technological aspects of the EEC's energy consumption and production patterns, forecasts future trends through 1990, and evaluates the prospects for energy cooperation and/or conflict between the EEC and the United States."

Knop, D. R. and J. F. Roorda. "Economic Restraints on U.S. Energy Supply and Demand." *Journal of Petroleum Technology*, v. 27, July 1975: 803–812.

"This paper analyzes the U.S. energy and economic situation through 1985 with emphasis on the necessary interrelationships. The relationships considered are those between prices and quantity demanded for various fuels in each fuel-consuming sector, the quantity of various fuels in each fuel-consumed sector, the quantity of various fuels supplied from domestic sources, oil imports and economic conditions."

Kooharian, Anthony. *Survey of External Studies on International Energy Issues*. Report prepared for the Federal Energy Administration, July 1974, 94 p. Available from the State Dept. as FAR 21873–G.

Kooharian, Anthony. "Technical Integration Plan for Project Independence: International Assessment: Final Report." Report prepared for the Federal Energy Administration, August 1974. 33 p. Available from the State Dept. as FAR 21872–G.

LaMori, P. "The National Security Policy Aspects of World Energy Supply and Demand," 1980–2030 (U.S.). Report prepared by Battelle Columbus Laboratories, Washington, D.C. for OASD/ISA, U.S. Dept. of Defense, February 1974. 350 p. Available from the State Dept. as FAR 20723–G or from the Commerce Dept. as AD 920 339 L.

Lovins, A. B. *World Energy Strategies*. Cambridge, Ballinger (for Friends of the Earth International) 1975. 131 p.

Nau, Henry R. "U.S. Foreign Policy in the Energy Crisis." *Atlantic Community Quarterly*, v. 12, Winter 1974 75: 426–439.

In response to higher petroleum prices, production cutbacks, and selective embargo, the U.S. sought to mobilize support for preexisting policies in the international system. The author explains that the U.S. used the energy crisis and its technological assets to pursue diplomatic aims.

Organisation for Economic Co-operation and Development. *Energy R&D: Problems and Perspectives*. [Paris, 1975] 243 p.

"To provide a detailed analysis of the specific problems involved in the formulation and implementation of a scientific and technological research policy covering all aspects of energy. . . ."

Reports of the Atlantic Council's Energy Policy Committee. *Atlantic Community Quarterly*, v. 13, Spring 1975: 23–93.

Contents.—World energy and U.S. leadership, by H. Cleveland.—An approach toward resolution of energy problems through international coordination and cooperation, by E. Thomson and R. Harbert.—Financing Free World energy supply and use, by J. Gray.

Rutz, Maj. Ernest F., Jr. *The Energy Crisis in Europe: U.S. Interests*. Research Study, Air Command and Staff College, Air University, May 1974. 84 p. Available from the State Dept. as FAR 21135–G or as AD 920 575L.

Schmidt, Maj. Paul R. "The Energy Crisis and Japan's Options to Secure Energy in Asia." Report No. 2380, Air Command and Staff College, Air University, May 1974. 41 p. Available from the State Dept. as FAR 21815–G.

Simonet, Henri. "Energy and the Future of Europe." *Foreign Affairs*, v. 53, Apr. 1975: 450-463.

During the past year two methods have been used by the U.S. and EEC countries to concert issues on energy policy. One, represented by the negotiations of the Energy Coordinating Group, has seen Europeans acting as individual nations. But in the negotiations of financial solidarity the Community has acted as a unit.

Tanzer, Michael. *The Energy Crisis: World Struggle for Power and Wealth.* New York, Monthly Review Press, 1975. 171 p.

"The author of this timely book, formerly an economist for Exxon's Asian-African affiliate and now president of his own consulting firm specializing in energy matters, asserts that there is actually no energy crisis in the sense of a physical shortage of hydrocarbon fuel resources. Instead, an artifically contrived scarcity has been created by certain "forces" (viz., the international oil companies) operating within the overall framework of the world capitalist economy. From this premise the author then undertakes a multifaceted analysis by examining these oil companies' relationships to their home governments (especially the United States), the OPEC countries, and the oil-consuming nations, as well as the prospects for energy in a rational world."

Tater, William, et. al. "Energy: the Recent Crisis and Future Prospects of the European Community and Japan." Report prepared for the Federal Energy Administration, August 1974. 197 p. Available from the State Dept. as FAR 20750–G.

U.S. Congress. House. Committee on Foreign Affairs. Subcommittee on Foreign Economic Policy. *Foreign Policy Implications of the Energy Crisis.* Hearings, 92d Cong., 2d sess. Washington, U.S. Govt. Print. Off., 1972. 455 p.

Includes a 92-page summary and analysis (with detailed table of contents) of the testimony of 14 experts and related discussion, and a 30-page bibliography, prepared by the Congressional Research Service.

U.S. Congress. House. Committee on Foreign Affairs. Subcommittee on Inter-American Affairs. *The Energy Crisis: Impact on Development in Latin America and the Caribbean.* Hearing, 93d Cong., 2d sess. March 27, 1974. Washington, U.S. Govt. Print. Off., 1974. 44 p.

U.S. Congress. House. Committee on International Relations. Subcommittees on International Organizations and on International Resources, Food, and Energy. *Legislation on the International Energy Agency, Hearings,* 94th Cong. 1st sess. March 26, 1975. Washington, U.S. Govt. Print. Off., 1975, 79 p.

The purpose of the hearings was to obtain information for oversight of the proposals that were made in the President's energy package to provide the Executive with the authority to carry out the terms of agreement of the international energy program.

U.S. Congress. House. Committee on International Relations. Subcommittee on International Resources, Food, and Energy. *U.S. International Energy Policy.* Hearing, 94th Cong., 1st sess. May 1, 1975. Washington. U.S. Govt. Print. Off., 1975. 189 p.

Energy policy—[U.S.]/Power resources—Conferences/Petroleum prices—[OPEC countries]/Petroleum—[OECD countries]/International economic relations/Energy policy—[OECD countries]/International Energy Agency.

U.S. Congress. Senate. Committee on Foreign Relations. *Energy and Foreign Policy.* Hearings, 93d Cong., 1st sess. May 30 and 31, 1973. Washington, U.S. Govt. Print. Off., 1974. 239 p.

Presents the state of policy as of May 1973. Foreign relations—[U.S.]/Petroleum—[U.S.]/Energy policy—[U.S.]

U.S. Congress. Senate. Committee on Interior and Insular Affairs. *International Energy Program.* Hearings, pursuant to S. Res. 45; the National Fuels and Energy Policy Study, 93d Cong. 2d sess. Nov. 26, 1974. Washington, U.S. Govt. Print. Off., 1975. 213 p.

Deals with energy policy in OECD member countries.

Willrich, Mason. *Energy and World Politics.* Riverside, New Jersey, The Free Press, 1975. 256 p.

This book "looks at the world energy problems from a political viewpoint." The author holds that "the political process operating within and among nations will determine the future of the world energy situation. This book probes these political processes from World War II to the present, analyzing the major international political issues, such as national security, the world economy, and the global environment, that have affected the present situation." The author assesses ". . . whether a harmonious pattern of international relationships is possible, and also considers the development of international institutions to manage the world energy problems in the future."

Woodliffe, J. C. "A New Dimension to International Co-operation: the OECD International Energy Agreement. *International and Comparative Law Quarterly*, v. 24, July 1975: 525–541.

Balance of payments/International cooperation/Energy policy—[OECD countries]/Petroleum allocation—[OECD countries]/International economic relations/International Energy Agency.

"World Energy Consumption and Production Over the Next 50 years: Summaries of Papers Presented at the 20th Pugwash Symposium, Arc-et-Senans, France, 4–8 July 1974." *Pugwash Newsletter*, v. 12, Jan. 1975: 124–149.

Partial contents.—Crisis of resource scarcity.—Some limiting factors in energy production, by F. Kohler.—Energy sources for the future: the need for international research and development, by J. Gueron.—The advisability of creating new institutions in the energy field, W. Frank.

Wright, Arthur W. "Contrasts in Soviet and American Energy Policies." *Energy Policy*, v. 3, Mar. 1975: 38–40.

"West Europeans, Japanese and Americans are accustomed to thinking of their own market-based economic systems as more flexible, hence more rational, than the rigid central planning systems employed in most Communist countries. It is startling, however, to compare the energy policies of the two different groups of countries. Dr. Wright contends that Communist planners are, by and large, pursuing a course of cautious, deliberate, rational energy decisions based (both domestically and internationally) on relative cost and price. In contrast, capitalist governments have shown us a pattern of draconian measures involving quantitative restrictions, suspension of the market mechanism, government manipulation of prices, encouragement and protection of monopoly—and even, during the energy panic of 1973–74, the attempted central planning of crude oil and refined products. In spite of official claims to the contrary, the results in the capitalist countries have been anything but rational."

Yager, Joseph A., and others. "Toward an International Energy Policy for the United States." Washington, Brookings Institution, 1975. 9 p. (Brookings Institution, Washington, D.C. Research report 141).

Report is adapted from "Energy and U.S. Foreign Policy; a Report to the Energy Policy Project of the Foundation," and is a review of U.S. foreign policy choices in the field of energy.

B. PETROLEUM AS A SOURCE OF ENERGY

American Enterprise Institute for Public Policy Research, National Energy Project. *Conference on World Oil Problems.* Proceedings, Washington, D.C., October 1974. 290 p. Available from the State Dept. as FAR 20819–P.

Bohi, Douglas R. and Milton Russell. *U.S. Energy Policy: Alternatives for Security.* Baltimore, The Johns Hopkins University Press (for Resources for the Future) 1975. 131 p.

". . . The book recommends finding U.S. oil security through accommodations and mutual "benefits between oil exporters and importers, rather than through U.S. 'policies that seek confrontation and all-out independence.' " (2)

Elsasser, Maj. Robert L. "An Analysis of Middle East Oil and Power Politics." Report No. 0975, Air Command and Staff College, Air University, May 1974. 48 p. Available from the State Dept. as FAR 21828–G.

Enders, Thomas O. "OPEC and the Industrial Countries: the Next Ten Years." *Foreign Affairs*, v. 53, July 1975: 625–637.

Foreign economic relations—[OECD countries]—OPEC countries/Foreign economic relations—[OPEC countries]—OECD countries/Petroleum/Energy policy—[OECD countries]/Cartels—[OPEC countries]

Galdi, Theodor W. *Data and Analysis Concerning the Possibility of a U.S. Food Embargo as a Response to the Present Arab Oil Boycott.* Prepared for the Committee on Foreign Affairs by the Foreign Affairs Division, Congressional Research Service, Library of Congress. Washington, U.S. Govt. Print. Off., 1973. 7 p. At head of title: 93d Cong., 1st sess. Committee print.

Argues that a U.S. food embargo would not have an effect comparable to the Arab oil embargo owing to the multiplicity of Arab food sources.

Hannan, Timothy H. "The Battle for Energy Independence: How Much of a Good Thing? "*Federal Reserve Bank of Philadelphia Business Review*, July–Aug. 1975: 3–10.

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Points out that America's vulnerability to periodic oil embargoes can be lessened, but the goal of achieving energy self-sufficiency in the next few years could cost more than it is worth.

Howell, Leon. "Asia, Oil, Politics, and the Energy Crisis: the Haves and the Have-nots." (International Documentation Series.) New York, International Publications Service, 1974.

Klebanoff, Shoshana. *Middle East Oil and U.S. Foreign Policy, With Special Reference to the U.S. Energy Crisis.* New York, Praeger, 1974. 288 p.

"Competent, fairly conventional history of American oil policy since the 1930s. Writing prior to the embargo, the author warned against dependence on Arab sources." (1)

Krueger, Robert B. *The United States and International Oil: A Report for the Federal Energy Administration on U.S. Firms and Government Policy.* New York, Praeger Publishers. 1975. 649 p. (Praeger Special Studies in International Economics and Development.)

"The thesis permeating Krueger's FEA report rests upon the contention that recent developments have rendered foreign but primarily U.S. based multinational oil companies 'hostages' to the indigenous Middle Eastern oil-producing governments. Thus, the oil companies have neither purposively nor willingly perpetrated the present energy situation; rather, they have been compelled to acquiesce to political events in the absence of any real bargaining leverage." Among the conclusions developed in this study are the following: the U.S. government should obtain information from oil companies concerning international petroleum arrangements which affect U.S. energy supplies and security; tariffs would be helpful to reduce demand for imports and to increase domestic production; and "a federally owned and operated petroleum corporation would, in the long run, be counterproductive for preserving U.S. security of petroleum supplies and only create further bureaucratic inefficiency." (2)

Lewis, Maj. John F. "The United States Energy Crisis and Saudi Arabia." Report No. 1580, Air Command and Staff College, Air University, April 1974, 54 p. Available from the State Dept. as FAR 21806-G.

The Middle East and the International System: II. Security and the Energy Crisis. London, International Institute for Strategic Studies [1975] 41 p. (Adelphi Papers, No. 115)

Partial contents.—Strengths and weaknesses of the oil weapon, by F. Itayim.—Natural resources and national security, by R. Cooper.—The energy problem and alliance systems: Europe, by K. Kaiser.—The energy crisis, the developing world and strategy, by B. Wariavwalla.

Mikdashi, Zuhayr. *The Community of Oil Exporting Countries: a Study in Governmental Cooperation.* Ithaca, Cornell University Press, 1972. 239 p.

". . . The major role of OPEC seems to have been in speeding up the learning process. As with any cartel, its success is far easier when swimming with the tide of a seller's market. This makes it unlikely that OPEC will prove to be a good model for other commodities for which the market tides are less favorable."

Sharebaugh, H. Robert. "Petroleum and Energy." *Annals of the American Academy of Political and Social Science,* v. 420, July 1975: 86-97.

"While the term *scarcity* does not describe precisely the short term world energy supply situation, recent developments have focused world attention on anticipated future scarcity. This article briefly defines scarcity as it applies to energy today; considers some of the implications of scarcity; and examines some considerations for the future. It emphasizes the United States petroleum energy situation, as seen in the perspective of world energy supply, and calls for more efficient use of energy, policies to stimulate new energy supplies, and international cooperation on a long term basis. Finally, it discusses the proper role of government in energy matters—specifically, domestic price controls, tax policy, research and development funding, and a floor cost for imported oil."

Solomon, Robert. "The Allocation of 'Oil Deficits' ". *Brookings Papers on Economic Activity,* No. 1, 1975: 61-87.

Investigates the balance-of-payments adjustment of the "oil deficits" among the OECD countries, arguing in favor of some fixity of exchange rates and against any direct attempts to influence capital or trade flows among the member countries.

Syliowica, Joseph S. and Bard E. O'Neill, eds. *The Energy Crisis and U.S. Foreign Policy.* New York, Praeger Publishers, 1975. 258 p. (Praeger Special Studies in International Politics and Government.)

"This book is essentially designed for the concerned citizen or student of American foreign policy rather than the policy maker or scholar. It offers a concise overview of the changing nature of U.S. energy requirements, the make-up of the international oil industry, the major Middle East states and their interests in the region, the political-military balance in the region, and the implications of the oil crisis for American foreign policy. . . ." (2)

Trilateral Task Force on the Political and International Implications of the Energy Crisis. *Energy: the Imperative for a Trilateral Approach.* New York, Trilateral Commission, 1974. 35 p.

Deals with energy policies in OECD and OPEC countries and issues of energy conservation.

U.S. Congress. House Committee on Foreign Affairs. *Data and Analysis Concerning the Possibility of a U.S. Food Embargo as a Response to the Present Arab Oil Boycott.* Prepared by the Foreign Affairs Division, Congressional Research Service, Library of Congress, November 21, 1973. Washington, U.S. Govt. Print. Off. 7. p.

U.S. Congress. House. Committee on International Relations. Subcommittee on International Organizations and Movements and Subcommittee on Foreign Economic Policy. *U.S. Policy and the International Energy Agency.* Hearings, 93d Cong. 2d sess. Dec. 1974. Washington, U.S. Govt. Print. Off., 1975. 59 p.

"Hearings . . . to review the potential impact on U.S. foreign and economic policies of the creation of the International Energy Agency (IEA) under the International Energy Program (IEP) signed by 16 oil-consuming members of the Organization for Economic Cooperation and Development, Nov. 18, 1974. IEP and IEA are established to developed cooperative approaches to meeting future fuel shortages and price increases, currently associated with the Organization of Oil Exporting Countries' export policies."

U.S. Congress. House. Committee on International Relations. Special Subcommittee on Investigations. *Oil Fields as Military Objectives: A Feasibility Study.* 94th Cong. 1st sess. Aug. 21, 1975. Washington, U.S. Govt. Print. Off., 1975. 111 p.

"Study prepared by CRS . . . examining difficulties and risks associated with any possible military action against oil producing states in the event of a crippling oil embargo." (3)

U.S. Congress. Joint Economic Committee. Subcommittee on International Economics. *Energy Imports and the U.S. Balance of Payments.* Hearings. Nov. 1973. Washington, U.S. Govt. Print. Off., 1973. 162 p.

"Hearings . . . to examine the relationship between the U.S. balance of payments and future energy imports. Appendix . . . contains introduction to and text of "Energy and the Balance of Payments" by the research and planning staff, Domestic and International Business Administration, Commerce Dept. Oct. 18, 1973." (3)

U.S. Congress. Senate. Committee on Foreign Relations. *The International Petroleum Cartel, The Iranian Consortium and U.S. National Security.* Hearing, 93d Cong. 2d sess. Feb. 21, 1974. Washington, U.S. Govt. Print. Off., 1974. 158 p. (Committee print.)

This contains previously secret documents from the National Security Council and the Departments of State and Justice, 1952–1961, which detail the history of policy conflicts regarding antitrust actions of U.S. petroleum companies.

U.S. Congress. Senate. Committee on Foreign Relations. Subcommittee on Multinational Corporations. *Multinational Corporations and U.S. Foreign Policy. Part 4: Multinational Petroleum Companies and Foreign Policy.* Hearings, 93d Cong. 2d sess. Jan. 28, 30, 1974. Washington, U.S. Govt. Print. Off., 1974. 214 p.

This is a continuation of the series of hearings on multinational corporations and foreign policy. These sessions dealt with the impact of multinational petroleum corporations and their effects on the energy crisis.

U.S. Congress. Senate. Committee on Foreign Relations. Subcommittee on Multinational Corporations. *Multinational Corporations and U.S. Foreign Policy, Part 5,* Hearings, 93d Cong. 1st sess. and 93d Cong. 2d sess. Oct. 11, Nov. 27, 1973 and Jan. 24, 28, 31, and Feb. 1 and 6, 1974. Washington, U.S. Govt. Print. Off., 1974. 296 p.

This is a continuation of the series of hearings on multinational corporations. This volume looks at the relationships between multinational petroleum companies and the Organization of Petroleum Exporting Countries (OPEC)

U.S. Congress. Senate. Committee on Foreign Relations. Subcommittee on Multinational Corporations. *U.S. Oil Companies and the Arab Oil Embargo: the International Allocation of Constricted Supplies.* Prepared by the Federal Energy Administration, Office of International Energy Affairs, January 27, 1975. Washington, U.S. Govt. Print. Off., 1975. 30 p. (Committee print.)

U.S. Congress. Senate. Committee on Government Operations. *Petropolitics and the American Energy Shortage.* 93d Cong., 1st sess. Washington, U.S. Govt. Print. Off. 1973. 13 p. (Committee print.)

"Report by Committee Member Abraham A. Ribicoff on a trip to study international and European aspects of the energy problem. Contains findings and conclusions regarding effective conservation measures, international cooperation, and alternative energy shortages." (3)

U.S. Dept. of State. Office of Media Services, "Current Foreign Policy: Energy; Cooperative World Action to Solve Shortages." [Washington, 1973] 6 p. (U.S. Dept. of State. Publication 8741) U.S. Dept. of State. General foreign policy series, 281.

"The U.S. is in the same position in hard hydrocarbons as the Middle East is in oil. By focusing harder on domestic oil production and accelerating the development of alternative sources of energy, our dependence on imports can be kept under control."

U.S. General Accounting Office. *Issues Related to Foreign Sources of Oil for the United States, Department of State; Report to the Congress by the Comptroller General of the United States.* [Washington] 1974. 65 p.

"This report discusses (1) the State Department's role before eruption of hostilities in the Middle East in October and Arab curtailment of petroleum exports and (2) the critical problems facing the Department in resolving the issues connected with the current and future availability of this vital raw material from sources outside the United States."

U.S. Library of Congress. Congressional Research Service. *A Study of the Relationships Between the Government and the Petroleum Industry in Selected Foreign Countries: Japan.* Prepared . . . at the request of Henry M. Jackson, Chairman, Committee on Interior and Insular Affairs, United States Senate, pursuant to S. Res. 45. Washington, U.S. Govt. Print. Off., 1975. 37 p. "Serial no. 94-10 (92-100)." At head of title: 94th Cong., 1st sess. Committee print.

Prepared by Larry A. Niksch, Foreign Affairs Division, CRS.

Energy policy—[Japan]/Petroleum industry—[Japan]/Government and business—[Japan].

U.S. Library of Congress. Congressional Research Service. *A Study of the Relationships Between the Government and the Petroleum Industry in Selected Foreign Countries: the Netherlands.* Prepared . . . at the request of Henry M. Jackson, Chairman, Committee on Interior and Insular Affairs, United States Senate, pursuant to S. Res. 45. Washington, U.S. Govt. Print. Off., 1975. 33 p. At head of title: 94th Cong., 1st sess. Committee print. "Serial No. 94-8 (92-98)"

Energy industries—[Netherlands]/Petroleum industry—[Netherlands]/Energy policy—[Netherlands]/Government and business—[Netherlands].

U.S. Library of Congress. Foreign Affairs Division. *A Study of the Relationships Between the Government and the Petroleum Industry in Selected Foreign Countries: the Federal Republic of Germany.* Prepared by the Congressional Research Service at the request of Henry M. Jackson, chairman, Committee on Interior and Insular Affairs, United States Senate, pursuant to S. Res. 45, the national fuels and energy policy study. Washington, U.S. Govt. Print. Off., 1975. 99 p. "Serial No. 94-21 (92-111)." At head of title: 94th Cong., 1st sess. Committee print.

U.S. Federal Energy Administration. Office of International Energy Affairs. *The Relationship of Oil Companies and Foreign Governments.* Washington, For sale by the Supt. of Docs., U.S. Govt. Print. Off., 1975. 205 p.

"The 30 countries included in this study were selected to provide a comprehensive view of foreign nations, both producers and consumers. All members of OPEC are included as are most members of the International Energy Agency."

U.S. Federal Energy Administration. Office of International Energy Affairs. *Report to Congress on: Foreign Ownership Control and Influence on Domestic Energy Sources and Supply.* Washington. For sale by the Supt. of Docs., U.S. Govt. Print. Off., 1974. 80 p.

". . . This report is an initial effort to assess the extent and character of foreign participation in our domestic energy industries. It provides a basis for evaluating the current status of that participation and for identifying areas warranting more intensive investigations."

Yager, Joseph A. and Eleanor B. Steinberg. *Energy and U.S. Foreign Policy.* (A report of the Ford Foundation's Energy Policy Project.) Cambridge, Massachusetts, Ballinger, 1974. 462 p.

Study which deals specifically with problems of international oil trade and the judicious channeling of nuclear energy development.

C. NUCLEAR ENERGY: RESEARCH AND COOPERATION

Bloomfield, Lincoln P. "Nuclear Spread and World Order." *Foreign Affairs,* v. 53, no. 4, July 1975: 743–755.

An essay which assesses the need for international attention to controlling the spread of nuclear weapons technology.

"Changing Role for OECD's Nuclear Energy Agency." *OECD Observer,* no. 66, 1973: 19–26.

Atomic energy—[OECD countries]/Radiation safety—[OECD countries]/ International cooperation in science/International agencies/Organization for Economic Cooperation and Development. Nuclear Energy Agency.

DiNolas, Massimo. "Nuclear Industry Prepares for Boom." *Atlantic Community Quarterly,* v. 12, summer 1974: 205–212.

Argues that European nuclear industries must rationalize and cooperate in order to prevent U.S. firms from dominating the atomic power plant market.

Donnelly, Warren H. "Some Notes on Congress and Nuclear Safeguards." Prepared for the Workshop on Plutonium, Safeguards, and the Breeder; Session on Safeguards and the Public of the Atomic Industrial Forum, October 23, 1974. 25 p.

Presents background on U.S. international cooperation agreements in nuclear power and safeguards measures and congressional reaction to these agreements.

Doub, William O. "A Compelling Priority: International Standards for Nuclear Safety." *Public Utilities Fortnightly,* v. 94, Sept. 26, 1974: 66–68.

"Disproportionate attention is being given development of new international safeguards against theft of nuclear materials, when in fact such safeguards already exist. What is needed, however, is a great effort toward international co-operation to write safety standards."

Doub, William O. and Joseph M. Dukert. "Making Nuclear Energy Safe and Secure." *Foreign Affairs,* v. 53, no. 4, July 1975: 756–772.

The author elaborates upon the following: ". . . the International Atomic Energy Agency is not without its problems. The Nonproliferation Treaty is far from a perfect treaty. Yet both have been workable and valuable in the past. In order for both to remain so in the future, there is no choice . . . but to strengthen systematically the stature, capabilities, and responsibilities of the IAEA. The best hope of linking substantial progress at the 1980 NPT Review Conference with arms-limitations agreements among the nuclear-weapons countries lies in the rapid achievements of this objective."

Droutman, Lawrence Julian. *Nuclear Integration: the Failure of Euratom.* Submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in the Faculty of Political Science, Columbia University, 1973. 369 p.

Traces the history of Euratom and its failure to integrate European nations through scientific cooperation.

Drozdiak, William M. "US-EC Uranium Relations." *European Community,* no. 187, June 1975: 8-11.

Article discusses the problems and confusion over the supply of nuclear fuels needed for European atomic programs. A recent change in U.S. export policy is causing the Europeans to seek other sources of nuclear fuels.

International Atomic Energy Agency. *Recommendations for the Physical Protection of Nuclear Material.* Vienna, 1972. 23 p.

Recommendations for physical protection of nuclear material in use, transit, and storage by a panel of experts assembled by the IAEA.

Jacobson, Harold Karan, and Eric Stein. *Diplomats, Scientists and Politicians: The United States and the Nuclear Test Ban Negotiations.* Ann Arbor, The University of Michigan Press, 1966, 506 p. plus bibliography and index.

"This study began in 1961 as a limited attempt to assess the impact of science and modern technology on the negotiating process and concepts of international organization, using the test ban negotiations then in process as a case study. When the Moscow Treaty was signed, however, it seemed wise to broaden the focus and to capture as many of the details as we could that might help to explain the first formal arms control agreement between East and West in the nuclear age." Source materials include "the records of the negotiations and the memoirs thus far published," and interviews with a large number of the participants. A concluding chapter relates this case to broader considerations in the formulation and execution of "American Security Policy," and international politics.

Nau, Henry R. *National Politics and International Technology: Nuclear Reactor Development in Western Europe.* Baltimore, Johns Hopkins University Press, 1974. 287 p.

"Through a careful analysis of the political dimensions of nuclear technology in Western Europe, Nau challenges present conventional wisdom: 'National politics, far from becoming an increasingly inappropriate perspective for studying technological relations among modernized societies, may be a more relevant focus than integration or interdependence.' " (1)

Nau, Henry R. "The Practice of Interdependence in the Research and Development Sector: Fast Reactor Cooperation in Western Europe." *International Organization*, v. 26, Summer 1972: 499–526.

Pendley, Robert and Lawrence Scheinman, with the collaboration of Richard W. Butler. "International Safeguarding as Institutionalized Collective Behavior." *International Organization*, v. 29, no. 3, Summer 1975: 585–616.

"International safeguards refer to a set of international agreements establishing control over the production, use, and final disposition of fissionable materials. Before the Non-Proliferation Treaty (NPT) went into effect, International Atomic Energy Agency (IAEA) safeguards had been applied to 75 reactors and ten other nuclear facilities under 51 different agreements. The design of the first regime was largely a function of political, strategic, and economic rather than technical considerations. After 1971, safeguards were made an integral part of the NPT, and became obligatory with respect to all peaceful nuclear activities in signatory states. Negotiations on the NPT safeguards regime focused on efforts to minimize the major asymmetrical costs that this implied, and particularly to meet the objections of major nonnuclear weapons states. The focus of controversy centered less on resistance to incursions on sovereignty than on demands for equity in incursion. In these negotiations, technological factors facilitated the construction of a politically acceptable regime."

Petros'yants, A. M. "Cooperation Through the 'Atoms for Peace' Program." *USA: Economics, Politics, Ideology,* no. 3, Mar. 1974: 1–13.

Russian report on the Soviet-American cooperation in the use of atomic energy for peaceful puposes.

Roberts, J. Tom. "Uranium enrichment: Supply, Demand and Costs." *Bulletin of the International Atomic Energy Agency,* v. 15, Oct. 1973: 14–24.

Details international supply, demand, and costs of enriched uranium.

Scheinman, Lawrence. "Safeguarding Nuclear Materials." *Science and Public Affairs,* v. 30, April 1974: 34–36.

Discusses the need for and problems in developing physical security systems for safeguarding special nuclear materials in an international context.

Segal, George. "Euratom Seeks a New Role." *New Scientist,* February 8, 1973: 310–311.

Describes the major crises Euratom faces: a failure of the European Economic Community to agree on the budget for the next proposed five year program, strikes of personnel at the research bases, and the fundamental question of whether or not the members of the EEC are prepared to accept a meaningful community effort in advanced technology.

Shalmon, E. "International Reference Centre for Environmental Radioactivity." *Bulletin of the International Atomic Energy Agency,* v. 15, Apr. 1973: 8–9, 11–12.

Slawson, Robert N. "International Safeguards." Remarks by Robert N. Slawson, Assistant Director for Agreements and Liaison, Division of International Programs, U.S. Atomic Energy Commission, at the AIF Public Affairs Workshop on Plutonium, Safeguards, and the Breeder. Oct. 10, 1974. 14 p.

Outlines the development of safeguards arrangements for material and equipment exported by the U.S., describes procedures and regulations related to implementation of arrangements, and examines current developments affecting the further evolution of safeguards.

Smith, David. "What Price Commercial Enrichment?" *Nuclear Engineering International*, v. 19, July 1974: 572–584.

Report on the Atomic Industrial Forum's conference on enrichment in Reston, Va., April 23–26, 1974. Topics discussed: U.S. enrichment capacity and future growth, implications for AEC contracts, enrichment projects in the U.S. and abroad, enrichment technologies, and the status of enrichment projects around the world.

Stockholm International Peace Research Institute. *Nuclear Proliferation Problems.* Cambridge, M.I.T. Press, 1974. 312 p.

Report of a group of experts assembled by SIPRI to review nuclear technology, NPT safeguards, cooperation in the peaceful applications of nuclear energy, and security problems of nonnuclear weapon states in anticipation of the 1975 Review Conference of the Treaty on the Non-Proliferation of Nuclear Weapons.

Stockholm International Peace Research Institute. *Safeguards Against Nuclear Proliferation.* Stockholm, Almquist and Wiksell/Cambridge, MIT Press, 1975. 114 p.

"An analysis of the important nuclear safeguards system of the International Atomic Energy Agency, by an Agency official. The conclusions emphasize the necessary element of cooperation by states: safeguards cannot be imposed." (1)

U.S. Congress. House. Committee on Foreign Affairs. *Resolution of Inquiry Into Proposed Nuclear Agreements with Egypt and Israel.* Hearings on H. Res. 1189 and H. Res. 1219, 93d Cong. 2d sess. July 9, 1974. Washington, U.S. Govt. Print. Off., 1974. 6 p.

U.S. Congress. House. Committee on Foreign Affairs. Subcommittees on International Organizations and Movements and on the Near East and South Asia. *U.S. Foreign Policy and the Export of Nuclear Technology to the Middle East.* Hearings, 93d Cong., 2d sess., June 25, July 9, 18; and Sept. 16, 1974. U.S. Govt. Print. Off., 1974. 333 p.

Hearings held on a proposed agreement to export nuclear technology to the Middle East and examine U.S. policies toward nuclear proliferation and international cooperation.

U.S. Congress. Joint Committee on Atomic Energy. *Amending the Atomic Energy Act of 1954, as Amended, to Enable Congress to Concur in or Disapprove Certain International Agreements for Peaceful Cooperation:* report to accompany S. 3698. Washington, U.S. Govt. Print. Off., 1974. 4 p. (93d Cong. 2d sess. Senate. Report No. 93–964.)

U.S. Congress. Joint Committee on Atomic Energy. *Amendment to Section 5 of the Euratom Cooperation Act of 1958, as Amended;* report . . . to accompany H.R. 8867. Washington, U.S. Govt. Print. Off., 1973. 10 p. (93d Cong. 1st sess. House. Report No. 93–385.)

U.S. Congress. Joint Committee on Atomic Energy. Subcommittee on Agreements for Cooperation. *Proposals for International Cooperation in Nuclear Energy.* Hearing, 94th Cong., 1st sess. Feb. 6, 1975. Washington, U.S. Govt. Print. Off., 1975. 16 p.

U.S. Congress. Joint Committee on Atomic Energy. Subcommittee on Agreements for Cooperation. *Proposed Amendment to Euratom Cooperation Act of 1958.* Hearing, 93d Cong., 1st sess. June 22, 1973. Washington, U.S. Govt. Print. Off. 1973. 57 p.

Hearings on S. 1993 and H.R. 8867, proposed amendments to section 5 of the Euratom Act of 1958, to increase the quantity of contained uranium-235 transferred to the European Atomic Energy Commission.

U.S. Congress. Senate. Committee on Banking, Housing, and Urban Affairs. Subcommittee on International Finance. *Exports of Nuclear Materials and Technology.* Hearing, 93d Cong., 2d. sess. July 1974. Washington, U.S. Govt. Print. Off., 1974. 120 p.

"Hearings . . . to review export policy and controls on nuclear materials and technology. Testimony covers present controls on nuclear technology, the role of the International Atomic Energy Agency and the Nuclear Non-Proliferation Treaty, and military implications of exporting nuclear materials." (3)

U.S. Congress. Senate. Committee on Government Operations. *Peaceful Nuclear Exports and Weapons Proliferation: A Compendium.* April 1975. 94th Cong., 1st sess. Washington, U.S. Govt. Print. Off., 1975. 1355 p. (Committee print.)

This is a comprehensive anthology of articles and reports dealing with nuclear exports and weapons proliferation. It was prepared for the committee to assist in considering S. 1439, the Export Reorganization Act of 1975—to reform the present Federal interagency system of controlling peaceful nuclear exports as well as the export of other strategically significant commodities. It was also intended to assist in considering the agenda of the Review Conference of the Nuclear Non-Proliferation Treaty Conference in Geneva in May 1975.

The document was prepared with the following objectives in mind: "It is in the interest of the United States and all nations to establish a strict, uniform system of nuclear safeguards for detecting diversion and preventing theft. Unfortunately, safeguards has long been a battleground for commercial advantage among nuclear exporting nations, including the United States. Short-term commercial interests have overshadowed long-term national security interest. The inclination has been not to apply strict safeguards conditions on commercial nuclear transactions out of fear that rival exporters will permit weaker safeguards in order to win a sale. This compendium is designed to provide a selected but comprehensive review of the legal, technical and policy aspects of this critical problem for all who seek an understanding of it."

Walsh, John. "Uranium Enrichment: Both the Americans and Europeans Must Decide Where to Get the Nuclear Fuel of the 1980's." *Science,* v. 184, June 14, 1974: 1160–1161.

Examines crucial decisions the United States and the member nations of the European Community must make concerning the creation of new uranium enrichment capacity.

Walsh, Warren Bartlett. *Science and International Public Affairs. Six Recent Experiments in International Scientific Cooperation.* [Syracuse,] International Relations Program, The Maxwell School of Syracuse University, 1967. 161 p.

Historical description of international scientific projects participated in by scientists at Syracuse University. The objective, according to the author, was to "identify and trace some of the impacts of science and scientists on international public affairs." The author describes formal and informal modes of interaction, contrasts the objectives of international cooperation with domestic political and social factors, such as labor union organization, and traces the evolution of objectives and organization of cooperation in international scientific research and development. Cases studied are: The European Center for Nuclear Research; The European Nuclear Energy Agency; The International Atomic Energy Agency; The European Atomic Energy Community; The European Space Research Organization; and The European Launcher Development Organization.

Willrich, Mason, ed. *International Safeguards and Nuclear Industry.* Baltimore, Johns Hopkins University Press, 1973. 307 p.

A study of the International Atomic Energy Agency, Nonproliferation Treaty safeguards system and the problems it must deal with.

Willrich, Mason and Theodore B. Taylor. *Nuclear Theft: Risks and Safeguards.* Cambridge, Ballinger, 1974. 252 p.

". . . The growing use of nuclear reactors to generate electric power will result in large amounts of materials that can be used to make nuclear weapons; these weapons are relatively easy to manufacture; terrorist organizations, criminal groups, or even one individual may be able to steal nuclear-weapons materials and threaten communities and governments. This report to the Energy Policy Project of the Ford Foundation offers specific recommendations for a system of safeguards." (1)

Wonder, Edward F. "Uranium Enrichment in American-European Relations." Woodrow Wilson Department of Government and Foreign Affairs, University of Virginia. 1973. 9 p.

Examines relations between the U.S. and Europe since World War II with respect to three dimensions of the issue of uranium enrichment: security, economics, and diplomacy.

ENVIRONMENTAL QUALITY: INTERNATIONAL ISSUES

Batisse, Michel, "Man and the Biosphere." *Nature*, v. 256, July 17, 1975: 156–158.

UNESCO's Man and the Biosphere Program endeavors to develop an integrated research approach to the management problems arising from the interactions between human activities and natural systems. The MAB Program comprises 14 project areas forming a kind of research matrix in which the main ecological systems and physiographical units interact with major activities, engineering works, or demographic changes.

Barros, James, and Douglas M. Johnston. *The International Law of Pollution*. Riverside, New Jersey, The Free Press, a Division of Macmillan Publishing Co., 1974. 385 p.

"Intended as a basic research tool for students and professionals, this is the first book to cover the entire development of international law relating to the prevention and control of pollution and related environmental problems. Using international agreements and judicial decisions as a basis, the volume provides the evidence of transnational actions taken to date and suggests the scope of future developments in the interdependent world community."

Baxter, William. "International Implications of an Effluent Tax System: Some Preliminary Observations." Stanford, California Center for Advanced Study in the Behavioral Sciences, Spring 1973, Report No. POST-BAXT-W-02: 16 p. also published in *Stanford Journal of International Studies*, v. 8, 1973: 1–15.

"To obtain an optimum level of pollution, a tax per unit of effluent could be imposed on polluting activities equal in amount to the harm caused per unit. This would cause the level of harm from pollution to fall until it was not more than that justifiable by the essentiality to the society of the product yielded by the activity. Within a nation, the tax rate should be determined for each region to encourage industry to relocate in less polluted areas. The authorities who administer the tax rates should have national responsibilities so that local industry is not economically protected. On an international level, pollution control should be administered by two bodies, one with world-wide representation and another made up of regional organizations. The first would coordinate the activities of the regional organizations and have direct control over effluents with world-wide dissemination characteristics; the second would have control over regional pollutants. The regions should be as narrowly defined as possible to avoid greater sacrifices by the poorer nations." (Supported by NSF RANN award: GI-29730.)

Bleicher, Samuel A. "An Overview of International Environmental Regulation." *Ecology Law Quarterly*, v. 2, winter 1972: 1–90.

"This article proposes a classification of areas in which international environmental regulation is inevitable: activities physically affecting other states, activities affecting shared resources, and international regulation of national environmental standards. The author discusses the current law within these categories and urges that governments abandon their narrow, piecemeal approaches to the problem in favor of consolidating these areas of environmental regulation into an integrated framework."

Booz, Allen and Hamilton, Inc., Washington, D.C. *Study of Balance of Trade Impact on U.S. Producers in Three Industries of Higher Costs of Environmental Protection*. Report prepared for the U.S. Dept. of State, January 1974. 186 p. Available from the State Dept. as FAR 19908–S.

Busterud, John A., "International Environmental Relations." *Natural Resources Lawyer*, v. 7, Spring 1974: 325–335.

Reviews U.S. involvement in international environmental affairs.

Caldwell, Lynton, K. *In Defense of Earth: International Protection of the Biosphere*. Bloomington, Indiana University Press, 1972. 295 p.

Historical overview of behavioral and institutional modifications needed to cope with problems of international environmental quality.

Clemens, Walter C. Jr. "Ecology and International Relations." *International Journal*, v. 28, no. 1, Winter 1972–1973: 1–27.

An interesting functionally oriented article on the relationship between the needs of ecological harmony and of international relations. The author concludes: "The true power base [in solving problems of international and national environmental quality and natural resource utility] may lie in education and consensus-building. Here, the ecologist and the political scientist should co-operate in stressing the interdependency of men and their life-support systems; the necessity of long-term planning; and the reality that non-zero-sum policies are in the long-term best interest of all."

Coan, Eugene V., Julia N. Hillis, and Michael McCloskey. "Strategies for International Environmental Action: the Case for an Environmentally Oriented Foreign Policy." *Natural Resources Journal*, v. 14, Jan. 1974: 87–102.

". . . The magnitude of the United States' impact on the world's environment demands that we undertake a variety of unilateral measures, from new regulations on exports and imports to a basic reorientation of our foreign policy. We must begin to assert greater control over the environmentally significant activities of our private sector abroad. . . ."

Contini, P. and P.H. Sand. "Methods to Expenditure Environmental Protection: International Ecostandards." *American Journal of International Law. Proceedings*, v. 66, Jan. 18, 1972: 37–59.

Dienes, Leslite. "Environmental Disruption and its Mechanism in East-Central Europe." Paper presented at the Annual Meeting of the Assn. of American Geographers, Seattle, April–May 1974. 13 p. Available from State Dept. as FAR 19524–P.

"The Environment—One Year of Community Action." *Industry and Society*, no. 28, July 16, 1974: 1–17.

"Now, nearly a year after the adoption of the European Economic Community programme, it is possible to draw up a balance sheet of the work done and decisions taken by the Community to improve the environment in the context of the action programme decided on."

Ferarn, Anne Thompson. "Transnational Political Interests and the Global Environment." *International Organization*, v. 28, winter 1974: 31–60.

This article attempts to "identify those transnational associations that have participated in the elaboration of international environmental policy-making, to characterize the functions performed by them, and to describe the points of access they have to international and government officials."

French, Peter L. "Africa's Response to Ecological Imperialism: a Paradigm on International Relations and the Third World." Paper presented at the First Annual Meeting of the New York State African Studies Assn., New Paltz, N.Y., April 1974. 18 p. Available from the State Dept. as FAR 18789–P.

Forester, William S. "Trade Consequences of Environment Cleanup." *Environmental Science & Technology*, v. 7, June 1973: 498–499.

"Federal antipollution laws will place U.S. industries competing abroad at a disadvantage unless foreign countries are required to pay fair shares of their own pollution abatement programs."

Herter, Christian A., Jr. "Protecting the Environment: a Global Problem Calling for an International Approach." *Vital Issues*. v. 23, Jan. 1974: 1–4.

A brief general review of world pollution problems and how the world community is beginning to respond as it faces many difficult decisions in the years ahead. Author is in charge of international environmental activities at the State Department.

International Bank for Reconstruction and Development. *Environment and Development*. [Washington] 1975. 33 p.

Explains how environmental problems arising with development can be mitigated by taking precautionary measures. Paper proposes that the World Bank Group continue its present project-by-project approach toward environmental and health problems.

International Cooperation for Pollution Control, United Nations Institute for Training and Research, 1972. 73 p. (UNITAR research report, #9.)

Kay, David A. and Eugene B. Skolnikoff, eds. *World Eco-Crisis: International Organizations in Response*. With an introduction by Maurice F. Strong. Madison, The University of Wisconsin Press, 1972. 324 p.

"The essays in this volume address themselves to the role, both existing and potential, of international institutions in coping with the environmental impacts of the widespread application of an increasingly potent science and technology." Among the institutions treated are: the UN, the WMO, regional organizations, and organizations relating to the issues of trade and developing countries.

Kneese, Allen, Sidney E. Rolfe, and Joseph W. Harneds, eds. *Managing the Environment: International Economic Cooperation for Pollution Control.* (Praeger special studies in international economics and development.) New York, Praeger Publishers, 1972. 356 p.

"This book adds a new dimension to the literature of international environmental problems. It goes beyond the usual discussion of oil spills or river pollution crossing national boundaries and the consequent need for bilateral or multilateral agreements between nations sharing common resources or boundaries. It raises the more complex question of the international trade consequences of varying national efforts to curb pollution and how these economic effects might be moderated through international agreements and agencies."

Kramer, John M. "Pollution in the USSR: A Partial Test of the Convergence Theory." Paper presented at the Conference on Soviet Resource Management and the Environment, University of Washington, Seattle, June 1974. 37 p.

Leider, Robert. "From Choice to Determinant: the Environmental Issue in International Relations." [Washington] National War College, Strategic Research Group, 1972. 21 p.

This article "attempts to classify the behavior of nations as they adjust to the new environmental realities. From there it seeks to project the altered concepts and power ingredients that may emerge and could redefine national interests and supporting strategies in the coming decade."

Revised version printed in *Orbis*, v. 76, winter 1973: 881–891.

Lobanov, L. "International Cooperation and the Environment." *International Affairs*, No. 11, Nov. 1973: 47–53.

Reviews Soviet involvement in international environmental affairs.

Merritt, Weldon I. "The Soviet-U.S. Environmental Protection Agreement." *Natural Resources Journal*, v. 14, Apr. 1974: 275–281.

Miller, A. J. "Doomsday Politics: Prospects for International Cooperation." *International Journal*, v. 28, winter 1972–73: 121–133.

Examines "a representative sample of the proposals that environmentalists and concerned political scientists have suggested as the basis of future international co-operation and, more important, to assess their prospects of success."

Muir, J. Dapray. "Legal and Ecological Aspects of the International Energy Situation." *International Lawyer*, v. 8, Jan. 1974: 1–10.

"It is clear that the energy situation is going to complicate considerably national and international efforts to resolve developing ecological problems. Already, the lines are being drawn by those concerned with the environment and those concerned with economic growth."

Natural Resources Journal. [Special number on international issues.] v. 13, April 1973.

Contents: Ian Brownlie, A survey of international customary rules of environmental protection; Lynton K. Caldwell, Concepts in development of international environmental policies; E. D. Brown, The conventional law of the environment; Michael Hardy, The United Nations Environment Programme; L. F. E. Goldie, International impact reports and the conservation of the ocean environment; Albert E. Utton, International water quality law; Howard J. Taubenfeld, International environmental law: air and outer space; J. W. Samuels, International control of weather modification activities: peril or policy; A. Dan Tarlock, Land use choice: national prerogative vs. international policy and Ludwik A. Teclaff, The impact of environmental concern on the development of international law.

Organisation for Economic Co-operation and Development. *The Polluter Pays Principle: Definition, Analysis, Implementation.* [Paris, 1975] 117 p. Pollution control—[OECD countries]—Finance/Environmental policy—[OECD countries]

Problems in Transfrontier Pollution: [Paris] Organisation for Economic Cooperation and Development [c1974] 316 p.

Partial contents.—Economic aspects of transnational pollution, by A. Scott.—Economic and related aspects, by J. Cumberland.—Transnational pollution and international law, by C. Bramsen.—Legal and institutional aspects of transfrontier pollution control, by R. Stein.

Robinson, Nicholas A. "Extraterritorial Environmental Protection Obligations of Foreign Affairs Agencies: the Unfulfilled Mandate of NEPA." *New York University Journal of International Law and Politics*, v. 7, Summer 1974: 257–270.

This article points out that "agencies charged with conducting the government's foreign affairs have resisted assessing the impact of their decisions which affect the environment abroad."

Quigg, Philip W. *Environment: the Global Issues.* [New York, Foreign Policy Association] 1973. 63 p. (Headline series, no. 217)

A Reader in International Environmental Science. Washington, U.S. Govt. Print. Off., 1971. 160 p. "Serial B" At head of title: Committee print. Prepared for the Senate Committee on Commerce and the House Committee on Science and Astronautics.

Contains a selection of materials as background information for the Joint Senate-House Colloquium on International Environmental Science on May 25–26, 1971. These papers offer an insight into major problems areas, the status of cooperative programs, and opportunities for further research.

Sammartano, Susan and James W. Howe. "Environment and Development." In *The United States and the Developing World: Agenda for Action, 1973.* [Washington] Overseas Development Council [c1973] p. 101–108.

Today the environment debate has at least two international dimensions. Environment problems face every country and, where they have transnational effects, require some international cooperation. And the environment debate has identified some areas of potential conflict between rich nations and poor.

Sherman, Harvey. *International Environmental Affairs in the 93rd Congress.* Multilith, Congressional Research Service, Library of Congress, Washington, D.C., May 21, 1975. 29 p. Multilith 75–132 EP.

Shields, Linda P. and Marvin C. Ott. "The Environmental Crisis: International and Supranational Approaches." *International Relations*, v. 4, November 1974: 629–648.

"What are the implications of environmental decay for the international political system? Will it generate additional sources of international instability and instruments of conflict or, conversely, will it spur new forms of transnational cooperation and integration? What governmental policies, if any, promise to strengthen the latter possibility and weaken the former?"

Shields, Linda P. and Marvin C. Ott. "Environmental Decay and International Politics: the Uses of Sovereignty." *Environmental Affairs*, v. 3, no. 4, 1974: 743–767.

Considers the potential impact of present and future environmental conditions on international politics and examines the question of whether an effective international effort to stem the tide of environmental abuse requires the elimination of the nation-state in favor of novel forms of supra-national authority.

Sprout, Harold and Margaret Sprout. *Multiple Vulnerabilities: the Context of Environmental Repair and Protection.* [Princeton, N.J.] Center for International Studies, Princeton University, 1974. 66 p. (Princeton University. Center of International Studies. Research monograph no. 40.)

Deals with the issues of environmental assessment and protection as they relate to international relations.

Sprout, Harold and Margaret Sprout. *Toward a Politics of the Planet Earth.* New York, Van Nostrand Reinhold Company, 1971. 499 p.

An ecological/environmental approach to international relations. After surveying a multitude of resource/interdependence issues, the Sprouts "anticipate that a more integrated, less nationalistic, 'politics of the planet earth' will be accomplished through cumulative increments of change. Decision makers in all the capitals are still playing two sets of games—one with foreign adversaries for such stakes as security, expansion, influence, or prestige; another set with their fellow citizens for such stakes as public order, education, housing, welfare, or rate of taxation. Insufficient resources will soon cause crises of priorities of domestic and external politics, possible with 'sensationally revolutionary' implications for the future of international politics."

Stausberg, Gary Igal. "The National Environmental Policy Act and the Agency for International Development." *International Lawyer*, v. 7, Jan. 1973: 46–64.

Analyzes the position taken by the State Dept. in behalf of AID to the effect that AID is not subject to certain procedural requirements of NEPA.

Strong, Maurice F. "A Global Imperative for the Environment." *Natural History*, v. 83, Mar. 1974: 41–50.

"International cooperation is needed more than ever as we approach the outer limits of world resources and the carrying capacity of the biosphere."

Teclaff, Ludwik A. and Albert E. Utton, eds. *International Environmental Law.* New York and Washington, Praeger, 1974. 270 p.

The essays in the book lead to the general conclusion that international concerns for the environment are increasingly impacting on international law.

Essays deal with: international customary rules of environmental protection, concepts in development of international environmental policies, controls over territorial, spatial and marine environments, the need for advance reporting requirements, international law and ocean protection pollution, international water quality law, the UN environment program, environmental law and air and outer space, and potential legal problems resulting from national attempts to control weather patterns.

Timberlake, James H. "The German Environmental Movement and the U.S. Military Presence." Case study prepared for the Sixteenth Session of the Senior Seminar in Foreign Policy, U.S. Dept. of State, 1973–1974: 20 p. Available from the State Dept. as FAR 19878–S.

Trzyna, Thaddeus C., ed. *World Directory of Environmental Organizations.* [San Francisco] Sierra Club, 1973. 155 p. "Preliminary edition."

U.S. Bureau of International Commerce. "U.S. Seeking to Lessen Impact of Pollution Controls on World Trade." *Commerce Today*, v. 2, Apr. 17, 1972: 9–13.

"Efforts to get international agreement now under way; 'polluter pays' idea is gaining."

U.S. Congress. Senate. Committee on Commerce. *The Need for a World Environmental Institute.* 92d Cong., 2d sess. Washington, U.S. Govt. Print. Off., 1972. 22 p. Committee print.

Presents the findings and recommendations of the Joint Colloquium on International Environmental Science held to consider, primarily, the need to deal with environmental problems at an international level, and the role of scientific information—and information exchange—in doing so; recognizing (1) that man's mismanagement of technology and resources poses a threat to global environmental quality, and thus to the long-term future of human society, and (2) that effective international management and decision-making processes are essential to the solution of global environmental problems, the Colloquium accordingly recommended the establishment of a World Environmental Institute to provide the necessary technical and scientific information to those processes; appended is the U.S. Senate resolution calling for the creation of a World Environmental Institute.

U.S. Congress. Senate. Committee on Commerce, and U.S. Congress. House. Committee on Science and Astronautics. *International Environmental Sciences. Proceedings of the Joint Colloquium, May 1971.* 92d Cong. 1st sess. Washington, U.S. Govt. Print. Off., 1971. 241 p.

Includes statements from scholars and statesmen, experts in international environmental problems, to "acquaint a broad sector of the Congress and the general public with the status, needs, and opportunities of international environmental science."

U.S. Council on Environmental Quality. *Environmental Quality: the Fourth Annual Report.* [Washington. For sale by the Supt. of Docs., U.S. Govt. Print. Off.] 1973. 499 p.

Includes extensive footnotes, appendices, and tables. Deals with international environmental quality.

U.S. Dept. of Commerce. *The Effects of Pollution Abatement on International Trade; the First Report of the Secretary of Commerce to the President and Congress in Compliance with Section 6 of the Federal Water Pollution Control Act Amend-*

ments of 1972 (Public Law 92-500). Washington, U.S. Govt. Print. Off., 1973. 32, A94 p. At head of title: 93d Cong., 1st sess. [House] Committee [on Public Works] print.

Discusses "the potential economic impacts of the evolving pollution control programs in the U.S. and abroad."

U.S. Dept. of Housing and Urban Development. Office of International Affairs. *Report on the U.S.-U.S.S.R. Working Group on the Enhancement of the Urban Environment, Second Joint Session*. Washington [1974] 60 p.

"The topics discussed were: comprehensive planning and development, construction in permafrost areas, solid waste management, noise abatement and control, urban transportation, historic preservation [and] new communities. At the instigation of the U.S. delegation, discussions also were held on recreation zones [and] housing management."

U.S. Dept. of State. Office of Media Services. *World Environmental Quality: a Challenge to the International Community*. [Washington, For sale by the Supt. of Docs., U.S. Govt. Print. Off., 1973] 37 p. (U.S. Dept. of State. Publication no. 8730)

Reviews international environmental cooperation in recent years, with emphasis on U.S. participation.

United Nations. Environment Programme. *The International Referral System for Sources of Environmental Information (IRS)*: report by the executive director. [New York] 1975. 6 p. (United Nations. [Document] UNEP/GC/31/Add. 3) International environmental cooperation

United Nations Environment Programme. *1974 Report on the World Social Situation; Part Two. Sectoral Developments; the Environment*. [New York] 1974. 13 p. (United Nations. [Document] E/CN.5/512/Add. 17) At head of title: United Nations Economic and Social Council.

Notes some of the "public-service" functions of the global environment and offers a selective review of environmental problems needing action far in advance.

United Nations. Environment Programme. Governing Council. *Review of the Environmental Situation and of Activities Relating to the Environment Programme: Report of the Executive Director*. [New York] 1975. 67. (United Nations. [Document] UNEP/GC/30)

Contains review of the priority subject area, "Land, Water and Desertification:" arid and semi-arid lands, soil loss, tropical forests and woodlands water quality.

United Nations. Environment Programme. Governing Council. *Review of the Environmental Monitoring System; Report of the Executive Director*. [New York] 1975. 17 p. (United Nations. [Document] UNEP/GC/31/Add. 2)

United Nations. *Organization and Administration of Environmental Programmes*. New York, United Nations, 1974. E. 74.II.H.5.

United Nations. Secretary-General (Waldheim). *Statistics of the Environment; Report*. [New York] 1974. 32 p. (United Nations. [Document] E/CN.3/452) At the head of title: United Nations Economic and Social Council.

"To meet the request of the seventeenth session of the Statistical Commission, this paper sets forth a draft programme of international work in the short and medium term on statistics of the environment."

Utton, Albert E. and Daniel H. Henning, eds. *Environmental Policy: Concepts and International Implications*. New York, Praeger Publishers, 1973. 267 p.

Among the articles with international implications are the following: "International environmental management: some preliminary thoughts;" "Environmental policy and international institutional arrangements: a proposal for regional and global environmental protection agencies;" "The changing structure of international policy: needs and alternatives;" "Environmental policy as a world order problem;" "Global pollution and human rights;" "National sovereignty in international environmental decisions;" and "The development of international environmental law and policy in Africa."

The book concentrates more on the political aspects of environmental degredation than do many other books of this nature which concentrate more on describing environmental problems.

Verquese, Dominique. "Europe and the Environment: Cooperation, a Distant Prospect." *Science*, v. 178, Oct. 27, 1972: 381-383.

". . . The antipollution movement has been slow in gathering momentum, and already the usual stumbling blocks to any common European policy inhibit progress."

Wallen, Carl C. "Global Atmospheric Monitoring." *Environmental Science & Technology*, v. 9, Jan. 1975: 30–34.

"Maintaining a watch on the weather and other air pollutants is becoming a worldwide concern."

Walter, Ingo. *Environmental Management and the International Economic Order.* New York, New York University, c1973. 85 p. (New York University. Center for International Studies. Policy papers, v. 5, no. 3)

Walter, Ingo. "International Environmental Policy and Economic Development: the Issues Reconsidered." Working papers series, 73–55, October 1973. 23 p. Available from the State Dept. as FAR 20217–P.

Warne, W. Robert. "The European Community's Environmental Program." *SAIS Review*, v. 18, no. 3, 1974: 38–47.

". . . Describes the history and current activities of the European Community in its environmental protection effort, providing a case study of supranational attack on problems of the environment."

Wolff, Edward A. "The World Environment and Resources Council (WERC)." *The Journal of Environmental Science*, v. 16, March/April 1973: 14–25.

Describes the activities being undertaken around the world for the establishment of an international, nongovernmental interdisciplinary forum for the exchange of information among technical specialists on the environment and earth resources.

"World Environmental Quality. A Challenge to the International Community. Dept. of State Publ. 8730. General Foreign Policy Series 280, October 1973. 39 p.

THE STOCKHOLM CONFERENCE

Aaronson, Terri. "UN Environment Agency Sent to Kenya." *New Scientist*, Jan. 11, 1973: 72–75.

"The United Nations decision to site its Environmental Secretariat in Nairobi represents a victory for the Third World view that malnutrition, poverty, disease have a higher priority than pollution. But the new U.N. agency starts life with severe problems."

Dosa, Marta L. "A View of the International Environmental Information Problem." *Special Libraries*, v. 64, Oct. 1973: 457–463.

"Report on the United Nations Environment Programme Governing Council and on the World Assembly of Non-Government Organizations Concerned with the Global Environment, June 5–26, 1973."

Engfeldt, Lars-Goran. "The United Nations and the Human Environment—Some Experiences. "*International Organization*, v. 27, summer 1973: 393–412.

". . . a non-technical summary of some experiences from the five years which have passed since the Swedish government took its initiative to place the problems of human environment on the agenda of the United Nations for the first time."

Environmental Studies Board. Committee for International Environmental Programs. *Institutional Arrangements for International Environmental Cooperation; a Report to the Department of State.* Washington, National Academy of Sciences, 1972. 74 p.

In a report prepared for the U.N. Conference on the Human Environment, recommends that the U.S. participate in international environmental programs and support new institutions and adapt old ones to better serve this end.

Gardner, R. N. "Role of the U.N. in Environmental Problems." *International Organization*, v. 26, Spring 1972: 238–254.

Joyner, Christopher C. and Nancy D. Joyner. "Global Eco-management and International Organizations: the Stockholm Conference and Problems of Cooperation." *Natural Resources Journal*, v. 14, Oct. 1974: 533–555.

". . . to briefly analyze the nature of the environmental crisis, to evaluate international machinery presently available for implementing restorative action, and to point out conflicting world priorities that are hindering genuine international environmental cooperation."

Langway, Lynn and Jerry Edgerton. "The U.S. at Stockholm." *Nation*, v. 15, July 10, 1972: 7–11.

Argues that the State Dept. dominated the U.S. delegation at the U.N. Conference on the Human Environment to the extent that the environment often came out second-best to U.S. foreign policy objectives.

McLin, Jon. "Stockholm: the Politics of 'Only One Earth.' " [Hanover, N.H.] American Universities Field Staff [1972] 12 p. (American Universities Field Staff. Fieldstaff reports, West Europe series, v. 7, no. 4 [Europe])

Summarizes the U.N. Conference on the Human Environment.

Schacter, O. et al. "Post-Stockholm: Influencing National Environmental Law and Practice Through International Law and Policy." *American Journal of International Law. Proceedings*, v. 66, Sept. 1972: 1–14.

Tinker, Jon. "World Environment: What's Happening at UNEP?" *New Scientist*, v. 66, June 12, 1975: 600–613.

Discusses the structure, function, and operation of UNEP, the United Nations Environment Programme.

Members of Congress for Peace Through Law. World Environment and International Cooperation Committee. "What's Happened Since Stockholm? International Environmental Action Since the 1972 Stockholm Conference on the Human Environment." In Extension of remarks of Don Fraser. *Congressional Record* [daily ed.] v. 120, Dec. 20, 1974: H12741–H12746.

Reviews the activities of the U.N. Environment Program.

U.S. Congress. House. Committee on Foreign Affairs. *The United Nations Environment Program Participation Act of 1973; Report to Accompany H.R. 6788.* [Washington, U.S. Govt. Print. Off.,] 1973. 3 p. (93d Cong., 1st sess. House Report no. 93–124.)

"The purpose of H.R. 6768 is to provide the congressional authorization necessary for U.S. participation in the United Nations environment program, including authorization to contribute funds to the United Nations Environment Fund."

U.S. Congress. House. Committee on Foreign Affairs. *Conference Report on United Nations Environment Program.* Report 93–642. 93d Cong., 1st sess. Washington, U.S. Govt. Print. Off., 1973.

U.S. Congress. House. Committee on Foreign Affairs. Subcommittee on International Organizations and Movements. *International Cooperation in the Human Environment Through the United Nations.* Hearings, 92d Cong., 2d sess., on H.R. 13116. Mar. 15 and 16, 1972. Washington, U.S. Govt. Print. Off., 1972. 101 p.

U.S. Congress. House. Committee on Foreign Affairs. Subcommittee on International Organizations and Movements. *Participation by the United States in the United Nations Environment Program.* Hearings, 93d Cong., 1st sess., on H.R. 5697. Apr. 5 and 10, 1973. Washington, U.S. Govt. Print. Off., 1973. 82 p.

U.S. Congress. House. Committee on Public Works. *Report on the United Nations Conference on the Human Environment.* 92d Cong., 2d sess., Washington, U.S. Govt. Print. Off., 1972. 39 p. (Committee print.)

Summarizes United States activities in conference and non-conference work and gives conclusions of the congressional group and the conference itself. In summary the report notes: "The above criticisms tend to show if anything, that, even though the Conference may not have generated a great many substantive proposals by which nations will be bound, it was realistic in its narrow scope and modest objectives. In the end there were no debilitating political stalemates though one seriously threatened. By avoiding more difficult and dangerous issues the Conference was able to end on a positive note rather than in turmoil. It did provide a focus for attention and promote discussion of worldwide pollution measures. As it is increasingly being demonstrated, the parts of the earth are complexly interdependent. Worldwide measures are needed. The Stockholm Conference hopefully will be the start of that type of action and the basis and examples for all future conferences."

U.S. Congress. Senate. Committee on Commerce. *1972 Survey of Environmental Activities of International Organizations.* Prepared by the Environmental Policy Division, Congressional Research Service, 92d Cong., 2d sess. Washington, U.S. Govt. Print. Off., 1972. 187 p. (Committee print.)

Prepared for the June 1972 Stockholm Conference on the Human Environment. According to Sen. Warren G. Magnuson: "A great wealth of scientific knowledge on the environment abounds in the organizations identified in this study. Perhaps more importantly, the large number of organizations represented here, together with the environmental specializations shown for them in the matrix presentation, demonstrates the need for the establishment of an information center from which policy makers at both the national and international levels can formulate effective programs to keep this planet habitable."

U.S. Congress. Senate. Committee on Foreign Relations. *U.N. Conference on Human Environment: Preparations and Prospects.* Hearings, 92d Cong. 2d sess. May 3–5, 1972. Washington, U.S. Govt. Print. Off., 1972. 163 p.

Hearings on U.S. preparations for the U.N. Conference on the Human Environment, Stockholm, June 1972. Much discussion was given to the prospects for future international environmental cooperation.

U.S. Congress. Senate. Committee on Foreign Relations. Subcommittee on Oceans and International Environment. *Participation by U.S. In United Nations Environmental Program.* Hearings, 93d Cong. 1st sess. Apr. 16, 1973. Washington, U.S. Govt. Print. Off., 1973. 26 p.

Hearings on bills to provide for U.S. participation in the UN Environment program.

U.S. Department of State. *U.S. National Report on the Human Environment.* Prepared for United Nations Conference on Human Environment, June 1972, Stockholm, Sweden. [Washington, For sale by the Supt. of Docs., U.S. Govt. Print. Off., 1971] 53 p. (U.S. Dept. of State. Publication 8588).

In preparation for the U.N. Conference on Human Environment, June 1972, Stockholm, Sweden, the United Nations member countries were requested to prepare national reports describing their environmental problems and discussing actions being taken to resolve them. This document is the U.S. response to that request.

United Nations. Conference on the Human Environment, Stockholm, 1972. *Report*. New York, United Nations, 1973. 77 p. (United Nations. [Document] A/CONF. 48/14/Rev. 1) "United Nations publication. Sales no. E. 73.II.A.14."

United Nations. Dept. of Economic and Social affairs. *Organization and Administration of Environmental Programmes*. New York, United Nations, 1974. 187 p. (United Nations. [Document] ST/ESA/16)

"The substance of the papers concerns those aspects of the United Nations Conference on the Human Environment having special relevance for the organization and management of government."

Wilson, Thomas W., Jr. "Creating Mechanisms for International Environmental Action: Requirements and Response." *Stanford Journal of International Studies*, v. 8, spring 1973: 113–122.

This comment examines the possible effectiveness of the U.N.'s "action plan" for the environment.

ISSUES OF FOOD AND POPULATION

Allen, James E. and Lynda P. Cole "Birth/Death Control: the Social Implications of Using Half a Technology. *Technology Assessment*, v. 2, Oct. 1974: 235–239.

"By failing to introduce similarly effective birth control technologies, we have placed many countries in the position of having to deal with staggering growth rates and the chaotic economic and social problems caused by such growth."

Bahr, Howard M., Bruce A. Chadwick, and Darwin L. Thomas, eds. *Population, Resources, and the Future: Non-Malthusian Perspectives*. Utah, Brigham Young University Press, 1972. 352 p.

Berelson, Bernard, ed. *Population Policy in Developed Countries*. New York, McGraw Hill, Inc., 1974. 793 p.

A Population Council book.

Berg, Alan, et al. *The Nutrition Factor: Its Role in National Development*. Washington, D.C., The Brookings Institution, 1973. 290 p.

The study was prepared under the auspices of the Brookings Institution and the Foundation for Child Development. "The discussion, . . . covers issues ranging widely from technology to the politics of nutrition. . . . Chapters [deal] with malnutrition and development, nutrition and the population dilemma, agricultural advances, problems in education . . ., infant feeding practices . . . fortification of foods . . ., the potential contributions of private industry, and public programs, lessons from the Indian experiment, and a broad discussion of policy directions and program needs. . . . The link between American domestic needs and foreign policy approaches to food distribution is very briefly but incisively explored. . . ." With respect to implementation of successful nutrition efforts, "Berg explores whether to fix administrative responsibility for nutrition programs on an interministerial council, on an existing ministry, or on a separate agency, and tends to favor a separate agency. Councils, he says, have proven to be ineffective"; and an existing ministry, where nutrition programs may be under the control of vested interests "is unlikely either to give support or to have the breadth necessary for an effective nutrition program."

Brown, Lester R. *In the Human Interest*. New York, W. W. Norton & Co. 1974. 190 p.

Discusses the problems arising from population growth on a finite planet.

Brown, Lester R. and Erik P. Eckholm. *By Bread Alone*. New York, Praeger, 1974. 272 p.

Explains how the spiraling rate of population growth plus increasing affluence is creating a demand for food that is straining the world's production capabilities. Calls for action now through population control and a change in diet of affluent minority.

Choucri, Nazli. *Population Dynamics and International Violence: Propositions, Insights, and Evidence*. Lexington, Lexington Books, 1974. 281 p.

"A neglected side of the population problem and its political dynamism is here examined rigorously and comprehensively. Interesting, suggestive, but inevitably not altogether conclusive."

Cottam, Grant. *The World Food Conference*. [Hanover, N.H.] American Universities Field Staff, 1974. 10 p. (American Universities Field Staff. Fieldstaff reports. West Europe series, v. 9, no. 5 [General])

"The World Food Conference's role in alleviating the imbalance between population growth and food production must be judged by follow-up action."

Council for Agricultural Science and Technology. *The Impact of an International Food Bank; a Report by a Task Force*. [Ames, Iowa] 1973. 16 p.

Delville, Robert. "A Food Law for the Future." *Food, Drug, Cosmetic Law Journal*, v. 28, May 1973: 351–358.

Argues for international standardization in basic principles of food regulation.

Eckholm, Erik P. *Fertilizer Scarcity and the Food Outlook.* [Washington] Overseas Development Council [1974.] 8 p. (Overseas Development Council. Communique on development issues, no. 26)

"The emergence in the mid-seventies of a global fertilizer shortage is clouding an already difficult world food outlook, and forcing close scrutiny of global distribution and investment patterns in this key industry."

Food Science in Developing Countries: a Selection of Unsolved Problems. Compiled by the Advisory Committee on Technology Innovation of the Board of Science and Technology for International Development, Commission on International Relations. National Research Council. Washington, D.C., National Academy of Sciences, 1974. 79 p.

Grant, James P. "Food, Fertilizer, and the New Global Politics of Resource Scarcity. *In* "Adjusting to Scarcity." Philadelphia, *American Academy of Political and Social Science,* 1975. (*Annals,* v. 420, July 1975) p. 11–30.

"Examines how the United States in its role as global food manager contributed significantly through its actions in 1973 and much of 1974 to the crises of the mid-1970's which brought to the world double-digit inflation, massive recession, and innumerable premature deaths, and how the World Food Conference marked a sharp turn in United States—and world—policy toward seeking a positive-sum game approach to the food and fertilizer problems—an approach by which all principal parties might gain."

Green, Stephen K. *United States Agricultural Policy and World Food Production.* Discussion Paper No. 3, C/75–12, April 1975. Center for International Studies, Massachusetts Institute of Technology. 163 p. Available from the State Dept. as FAR 22020–P.

Gurr, Ted R. and Herman Weil. *Population Growth and Political Conflict: a Correlational Study of 84 Nations.* Report supported by the National Science Foundation, Guggenheim Foundation and INR/XR, U.S. Dept. of State, July 1973. 35 p. Available from the State Dept. as FAR 19451–G.

Humphrey, Hubert H. *Hunger and Diplomacy: a Perspective on the U.S. Role at the World Food Conference.* Washington, U.S. Govt. Print. Off., 1975. 169 p. At head of title: 94th Cong., 1st sess. Committee print.

Johnson, D. Gale. *World Agriculture in Disarry.* New York, St. Martin's Press, 1973. 304 p.

"A leading American expert digs deeply into the national farm policies of the industrial countries to show their costs, effects and contradictions. His proposals for national and international measures to improve trade and production deal with the long-run conditions rather than current fears of global shortage."(1)

Johnson, D. Gale and John A. Schnittker, eds. *U.S. Agriculture in a World Context: Policies and Approaches for the Next Decade.* New York, Praeger (for the Atlantic Council of the U.S.) 1974. 260 p.

"The policies of other countries as well as the United States are examined, and then the editors . . . conclude with a set of proposals for international agreements that would make for the better ordering of world agriculture." (1)

Klatt, W. "Asia After the World Food Conference." *International Affairs,* v. 51, no. 3, July 1975: 344–357.

The author notes that "Whilst the Rome conference dealt at length with the technical, organizational and financial side of the business in hand it paid only scant attention to the institutional aspects of the world food problem." Institutional reforms are needed to cope with the food/population crisis; these are detailed with respect to the situation in Asia.

Lee, Everett S. "Population and Scarcity of Food." *Annals of the American Academy of Political and Social Science,* v. 420, July 1975: 1–10. (Research funded by the RANN Program, National Science Foundation.)

"The world's population is growing at a rate which cannot be sustained. Rapid growth, however, is seldom found outside developing countries, while developed countries are close to zero population growth. Since World War II there have been impressive gains in agricultural productivity in developed countries, but in underdeveloped countries there has been little or no improvement in per capita production. Western methods of agriculture, though highly productive in yield per acre or yield per man-hour, are so extravagant in the use of energy that these methods are not transferable. Agricultural methods which are sparing in the use of energy must be developed for all countries, but particularly for undeveloped countries. Still, no foreseeable

improvements in agricultural production will permit long term growth of population in underdeveloped countries. The time remaining to make the necessary adjustments between population and natural resources is short, and there is no time for social and economic developments to bring down the birth rate in developing countries in the gradual fashion of developed countries."

McLin, Jon. "Western Europe and the World Food Problem." *American Universities Field Staff, Inc. West Europe Series*, IX, 6 (General), January 1975. 16 p. Available from the State Dept. as FAR 21832-P.

Nanda, Ved P. "The Role of International Law and Institutions Toward Developing a Global Plan of Action on Population." *Denver Journal of International Law and Policy*, v. 3, spring 1973: 1-44.

This article reviews the population problem in terms of "(a) food and nutrition; (b) resources, energy, and environment; (c) economic and social aspects; and (d) global fertility trends and family planning programs."

National Academy of Sciences. *In Search of Population Policy: Views From the Developing World*. Washington, D.C., 1974. 108 p.

A report on five regional seminars conducted in 1973 by the Office of the Foreign Secretary, Commission on International Relations, National Academy of Science-National Research Council and co-sponsoring institutions in developing countries.

National Academy of Sciences. *Rapid Population Growth: Consequences and Policy Implications*. Prepared by a study committee of the Office of the Foreign Secretary, National Academy of Sciences with the support of the Agency for International Development. Baltimore, Md., and London, Johns Hopkins Press, 1971. Vol. I, summary and recommendations, 105 p. Vol. II, research papers, 690 p.

Nau, Henry R. "Interpreting U.S. Foreign Policy on Food and Energy." Paper presented at the Annual Meeting of the American Association for the Advancement of Science, New York City, January 1975. 21 p. Available from the State Dept. as FAR 21314-P.

North, Robert C. and Nazli C. Choucri "Population and the International System: Some Implications for United States Policy and Planning." In Nash, A. E. Kier, ed. *Governance and Population: the Governmental Implications of Population Change*. [Washington, U.S. Commission on Population Growth and the American Future, for sale by the Supt. of Docs., U.S. Govt. Print. Off., 1973] pp. 251-278.

Presents a partial theory linking population growth, advances in technology and availability of resources with considerations of domestic and international politics.

Partan, Daniel G. *Population in the United Nations System: Developing the Legal Capacity and Programs of U.N. Agencies.* Durham, North Carolina, Rule of Law Press, 1973. 219 p.

Piotrow, Phyllis Tilson. *World Population Crisis: The United States Response.* New York, Praeger, 1973. 276 p.

Focuses in detail on the various steps by which government policy toward birth control was reversed.

Poleman, Thomas T. and Donald K. Freebairn, eds. *Food, Population, and Employment—the Impact of the Green Revolution.* New York, Praeger, 1973. 272 p.

Scali, John. "The Link Between Population and Other Global Issues." *Dept. of State Bulletin*, v. 17, Mar. 24, 1975: 392-396.

Discusses the link between food and population issues, urging LDCs to focus on the measures necessary to keep populations and food resources in a favorable balance.

Steinhart, John S. "Food and Energy as Policy Determinants: More Questions Than Answers." Paper presented at the Annual meeting of the American Association of the Advancement of Science, New York, Jan. 1975. 20 p. Available from the State Dept. as FAR 21576-P.

Symonds, Raymond and Michael Carder. *United Nations and the Population Question*, New York, McGraw Hill, Inc., 1973.

Teitelbaum, Michael S. "Population and Development: is a Consensus Possible?" *Foreign Affairs*, v. 52. no. 4, July 1974: 742-760.

Concludes with recommendations for population policies based on consensus positions which account for the following positions: "population-programs-plus-development; accommodationist, pro-natalist; holistic development; social justice; provision of services; and human rights."

U.S. Central Intelligence Agency. Office of Political Research. *Potential Implications of Trends in World Population, Food Production, and Climate.* [Washington] 1974. 42, [9] p. (U.S. Central Intelligence Agency. Office of Political Research. OPR-401)

U.S. Congress. House. Committee on Agriculture. Subcommittee on Department Operations. *World Population and Food Supply and Demand Situation.* Hearings, 93d Cong., 2d sess., July 1974. Washington, U.S. Govt. Print. Off., 1974. 188 p.

"Hearings . . . to examine problems and policy questions associated with the world population and food supply and demand situation." Includes testimony of public and private witnesses. (3)

U.S. Congress. House. Committee on Foreign Affairs. *1. World Food Conference. 2. European Security Situation.* Report of the Special Mission to Europe, Nov. 6-17, 1974. 93d Cong., 2d sess. Washington, U.S. Govt. Print. Off., 1974, 16 p.

Examines aspects of the European security situation, particularly the Mutual and Balanced Force Reduction negotiations in Vienna; and reviews issues relating to NATO and European security, food conference proceedings and recommendations, the International Atomic Energy Agency, the East-West Trade Center, the Austrian transit facility for emigration, and the International Institute for Applied Systems Analysis.

U.S. Congress. House. Committee on Foreign Affairs. *International Food Reserves: Background and Current Proposals.* Prepared for the Subcommittee on International Organizations and Movements by the Foreign Affairs and Environmental Policy Division of the Congressional Research Service, Library of Congress. 93d Cong., 2d sess., Oct 1974. Washington, U.S. Govt. Print. Off., 1974. 138 p. At head of title: committee print.

U.S. Congress. House. Committee on Foreign Affairs. Subcommittee on Africa and Subcommittee on International Organizations and Movements. *World Food Security: A Global Priority.* Hearings. 93d Cong., 2d sess., July 1973. Washington, U.S. Govt. Print. Off., 1973. 109 p.

"Hearings . . . on the capacity of the international community and its organizations to insure food stocks in time of serious shortage." (3)

U.S. Congress. House. Committee on Foreign Affairs. *Report on the World Food Conference.* Hearings, 93d Cong., 2d sess. Nov. 26, 1974. Washington, U.S. Govt. Print. Off., 1974.

U.S. Congress. House. Committee on Foreign Affairs. Subcommittee on International Organizations and Movements and Subcommittee on Foreign Economic Policy. *U.S. Policy and World Food Needs.* Hearings, 93d Cong., 2d sess. Sept. 1974. Washington, U.S. Govt. Print. Off., 1974. 163 p.

"Hearings . . . to examine current world famine problems and the future outlook for global food needs and availabilities." Relates specifically to more equitable worldwide fertilizer distribution.

U.S. Congress. House. Committee on International Relations. *Famine Prevention and Freedom From Hunger.* Aug. 15, 1975. 94th Cong., 1st sess. Washington, U.S. Govt. Print. Off., 1975. 39 p. (Committee print.)

"Excerpts from the committee report on H.R. 9005, the International Development and Food Assistance Act of 1975, which focuses on the impact of section 311 of the bill to add to the Foreign Assistance Act of 1961 a new section XII entitled Famine Prevention and Freedom from Hunger. It includes an analysis of AID progress with development and technical assistance under the Foreign Assistance Act." (3)

U.S. Congress. House. Committee on International Relations. *Report on the World Food Conference.* Official Report of the United States Delegation to the World Food Conference, Rome, Italy, November 5-16, 1974. Hearings. Washington, U.S. Govt. Print. Off., 1974. 69 p.

U.S. Congress. Senate. Committee on Agriculture and Forestry. *Hunger and Diplomacy: A Perspective on the U.S. Role at the World Food Conference.* 94th Cong., 1st sess. Feb. 4, 1975. Washington, U.S. Govt. Print. Off., 1975. 169 p. Committee print.

Contains report for the Subcommittee on Foreign Agricultural Policy on preparations for work of the World Food Conference, held in Rome, Nov. 5-16, 1975.

U.S. Congress. Senate. Committee on Agriculture and Forestry. Subcommittee on Agricultural Production, Marketing, and Stabilization of Prices. *U.S. and World Food Security.* 93d Cong., 2d sess. Washington, U.S. Govt. Print. Off., 1974. 71p. (Committee print.)

Contains papers dealing with world food and fiber reserves.

U.S. Congress. Senate. Committee on Agriculture and Forestry. Subcommittee on Foreign Agricultural Policy. *Implementation of World Food Conference Recommendations.* Hearing, 94th Cong., 1st sess. May 1, 1975. Washington, U.S. Govt. Print. Off., 1975. 95 p.

Food—Conferences/Food supply/Agricultural assistance/International agricultural cooperation/Food relief/World Food Conference, Rome, 1974.

U.S. Congress. Senate. Committee on Agriculture and Forestry. Subcommittee on Foreign Agricultural Policy. *World Food Conference: Selected Materials for the Use of the U.S. Congressional Delegation to the World Food Conference,* Rome, Italy, Nov. 5–16, 1974. 93d Cong. 2d sess. Washington, U.S. Govt. Print. Off., 1974. 377 p. (Committee print.)

"Compilation contains two U.N. Secretarial documents together with related documents from other sources.

U.S. Congress. Senate. Committee on Foreign Relations. Subcommittee on South Asian Affairs and the Subcommittee on African Affairs. *World Food Grain Situation.* Hearings, 93d Cong., 1st sess. Oct. 1973. Washington, U.S. Govt. Print. Off., 1973. 94 p.

"Hearings . . . to consider the world food situation and possible U.S. measures to guide and assist in food supply emergencies. Witnesses focus chiefly on food crises in Bangladesh, the African drought area, and Pakistan. Witnesses also review recent U.S. foreign food aid under P.L. 480, and contributions made to food programs sponsored by the Food and Agriculture Organization and the U.N." (3)

U.S. Congress. Senate. Committee on the Judiciary. Subcommittee on Refugees and Escapees and Subcommittee on Health, Senate Committee on Labor and Public Welfare. *World Hunger, Health, and Refugee Problems. Part 2: Food Scarcity, Nutrition and Health.* Hearings, 93d Cong., 2d sess. Oct. 1973. Washington, U.S. Govt. Print. Off., 1973. 370 p.

"Continuation of hearings . . . on the relationship between world hunger and health problems. This volume examines the extent of world food scarcities, nutritional needs and associated health problems. Includes text of S. Con. Res. 50, to express the sense of the Congress favoring a world food conference and U.S. participation. Appendixes contain submitted statements, articles, U.N. materials on international agriculture and food supplies." (3)

U.S. Congress. Senate. Committee on the Judiciary. Subcommittee on Refugees and Escapees and Subcommittee on Health, Senate Committee on Labor and Public Welfare. *World Hunger, Health and Refugee Problems. Part 3: Development and Food Needs.* Hearing, 93d Cong., 1st sess, Oct. 1973. Washington, U.S. Govt. Print. Off., 1973. 152 p.

Examines the impact of food scarcities on developing countries.

U.S. Congress. Senate. Select Committee on Nutrition and Human Needs. *National Nutrition Policy: Nutrition and the International Situation—III. Report on Rome: the Challenge of Food and Population.* Washington, U.S. Govt. Print. Off., December 1974. 283 p.

U.S. General Accounting Office. *Increasing World Food Supplies—Crisis and Challenge,* Department of State and other agencies; report to the Congress by the Comptroller General of the United States. [Washington] 1974. 72 p. B-159652, Sept. 6, 1974.

U.S. General Accounting Office. *Assistance to Family Planning Programs in Southeast Asia,* Agency for International Development; report to the Congress by the Comptroller General of the United States. [Washington] 1973. 53 p. B-173240, May 23, 1973.

U.S. General Accounting Office. *U.S. Technical Assistance to Support Indian Agricultural Development,* Agency for International Development, Department of State; report to the Congress by the Comptroller General of the United States. [Washington] 1972. 60 p. B-161854, June 22, 1972.

United Nations. *Concise Report on the World Population Situation in 1970–1975 and its Long-range Implications: Summary and Conclusions Presented to the Economic and Social Council in accordance with its Decision of 8 August 1968.* [New York, United Nations] 1975. 12 p. (United Nations. [Document] E/5624.).

United Nations. Economic and Social Council. Ad Hoc Interagency Task Force. *World Programme of Development Research and Application of Science and Technology to Solve the Special Problems of the Arid Areas; Obstacles to Development of Arid and Semi-arid Zones.* [New York] 1975. 54 p. (United Nations [Document] E/C.8/WG.1/5).

Reviews obstacles to development in arid and semi-arid lands. Points out that the development of stable agriculture—whether by grazing or by irrigation—is far more complex than had been thought.

United Nations. *General Discussion of International Economic and Social Policy, Including Regional and Sectoral Developments; World Economic Survey, 1974—part two; Current Economic Developments.* [New York] United Nations, 1975. 4 v. (United Nations. [Document] E/5681). At head of title: United Nations Economic and Social Council.

Contents.—World production.—World trade and payments.—Internal balance.—Outlook. Industrial production/Agricultural production/International trade/Economic conditions/Energy consumption/Petroleum.

United Nations. Population Studies. No. 56. *Concise Report on the World Population Situation in 1970–1975 and Its Long-Range Implications.* New York, United Nations, 1974. E. 74.XIII.4.

United Nations. "Report of the World Food Conference, Rome, 5-16, November 1974. New York, United Nations, 1975. 64 p. (75. II. A.3.).

World Food Conference, Rome, 1974. *Report.* New York, United Nations, 1975. 64 p. (United Nations. [Document] E/CONF. 65/20) "United Nations publication. Sales no. 75.II.A.3."

Food—Conferences/Food supply/Food relief/Agriculture—[Developing countries]/International agricultural cooperation/Agricultural assistance/Hunger/World Food Conference, Rome, 1974.

"World Food Resources; a Symposium, pt. 1." *Current History,* v. 68, June 1975: whole issue. Seven articles explore population pressures and food resources across the world in the first of a two-issue symposium on world resources.

Contents.—Food and food policy in the industrial nations, by V. Sorenson and L. Hamm.—The Soviet grain shortage, by D. Johnson.—The Asian dilemma by I. Prybyla.—The land-population balance in Latin America, by N. Sanchez-Albornoz.—Food and population in Africa, by D. Heisel.—World population and food needs tomorrow, by T. Dow, Jr.—The world food problem: possibilities of international action by F. Sanderson.—Readings on food and energy.

Wriggins, W. Howard and James F. Guyot, ed. *Population, Politics, and the Future of Southern Asia.* New York, Columbia University Press, 1974. 402 p.

A collection of papers given at a conference on Population, the Human Condition and Politics in Southern Asia, November 1971, at the Southern Asian Institute, Columbia University. The papers deal with the basic demographic changes, processes and effects of urbanization, and the particular problems and opportunities resulting from the increased numbers of youth in the population of the area.

GLOBAL HEALTH

"Aspects of International Health Work in 1974." *WHO Chronicle*, v. 29, no. 7, July 1975: 264–282.

Belmont, Rose. "Twenty-five Years of World Health Organization Action." *War on Hunger*, v. 7, August 1973: 6–10.

Reviews WHO action in the field of medicine and health for the last twenty-five years.

Fry, John and W. A. J. Farndale, eds. *International Medical Care: a Comparison and Evaluation of Medical Care Services Throughout the World.* Wallingford, Pennsylvania, Washington Square East, Publishers, 1972. 341 p.

Attempts to define some of the problems in the provision of medical care and to examine how some nations are trying to find solutions. Includes sections on international trends; and care in Europe, the United Kingdom, the United States, Canada, the U.S.S.R., Australia, the developing nations, and the world medical association. A variety of functional topics are also discussed.

Jus, Andrzej. "Social Systems and the Criteria of Health as Defined by WHO." *American Journal of Psychiatry*, v. 130, Feb. 1973: 125–131.

Kaplan, Martin. "Science's Role in the World Health Organization." *Science*, v. 180, June 8, 1973: 1028–32.

Methods for amplifying the effects of scientific resources on global health problems are described. Especially emphasizes five areas of needed cooperative research: development of a worldwide health information network; parasitic diseases, the biology of human reproduction, toxic chemicals, and improved technological diagnostic aids.

Kim, Joungwon Alex and Carol Campbell Kim. "The Divided Nations in the International System." *World Politics*, v. 25, July 1973: 479–507.

Deals, in part, with activities of the World Health Organization.

Mahler, H. "Further Thoughts on WHO's Mission." *WHO Chronicle*, v. 29, no. 7, July 1975: 253–256.

Mahler, H. "Health Strategies in a Changing World." *WHO Chronicle*, v. 29, June 1975: 209–218.

"Gives a broad survey of health priorities in the world today and outlines some of the new approaches that have emerged in the field of international public health."

Martin, Johns. "The WHO: 1948–1973." *Intellect*, v. 1028, Nov. 1973: 120–121.

Murray, Robert. "Transatlantic Occupational Health." *Journal of Occupational Medicine*. Vol. 17, no. 4, April 1975: 225–230.

In this Sappington lecture for 1974, the author, a physician, gives historical perspective to U.S. and British experiences in developing occupational health programs and describes the role of international organizations. Transatlantic cooperation has helped in stimulating programs to benefit workers, but far more programs are needed and they must be supported by better scientific understanding and research.

"Oh, New Delhi, Oh, Geneva." *Nature*, v. 256, July 31, 1975: 355–357.

Describes the controversy surrounding the Research United On Genetic Control of Mosquitos, New Delhi, which was accused by India of being a front for U.S. biological warfare experiments. The World Health Organization withdrew from the organization after continued criticism.

National Heart and Lung Institute. Public Inquiries and Reports Branch. *The United States-Union of Soviet Socialist Republics Joint Program in Cardiovascular Diseases.* [Washington] U.S. National Institutes of Health [1975?] 28 p. (U.S. Dept. of Health, Education, and Welfare. DHEW publication no. (NIH) 75–726).

U.S. Congress. House. Committee on Foreign Affairs. Subcommittee on International Organizations and Movements. *U.S. Support for the South Pacific Commission and the International Agency for Research on Cancer.* Hearing, 92d Cong., 2d sess., on H. Res. 1211 and H.J. Res. 1257. July 20, 1972. Washington, U.S. Govt. Print. Off., 1972. 34 p.

U.S. Congress. Senate. Committee on Foreign Relations. *International Agency for Research on Cancer*. Sen. Rept. 92–1113. 92d Cong. 2d sess. Sept. 13, 1972. Washington, U.S. Govt. Print. Off., 1972. 13 p.

Report which recommends passage with some amendments to a bill to authorize appropriations for annual U.S. contributions to support the International Agency for Research on Cancer.

U.S. Congress. Senate. Committee on Labor and Public Welfare. Special Subcommittee on International Health, Education, and Labor Programs. *International Health Programs, 1972*. Hearings, 92d Cong., 2d sess., on S. 3023, June 1972. Washington, U.S. Govt. Print. Off., 1972. 185 p.

Deals with health needs and resources of the developing countries. The bill addresses creation of an International Health Agency to coordinate fragmented efforts to provide health care through organizations such as AID, WHO, and other private and voluntary groups.

U.S. Dept. of State. *The United States-Japan Cooperative Medical Science Program: Five Year Report, 1965–1970*. Washington [for sale by the Supt. of Docs., U.S. Govt. Print. Off., 1971] 148 p. (U.S. Dept. of State. Publication 8598).

Areas of study included cholera, leprosy, malnutrition, filariasis, schistosomiasis, tuberculosis and viral diseases. Includes bibliographies.

Venediktov, D. D. Initial Results of Cooperation in Health and Medical Research." *USA: Economics, Politics, Ideology*, no. 9, Sept. 1973: 16–26.

Cooperation in Soviet-American health programs.

Wallen, O. "Pharmaceutical Reference Standards." *WHO Chronicle*, v. 26, Sept. 1972: 389–393.

Reviews the development of a few national reference standard programs and gives an account of WHO activities in this area.

"WHO: How It is Making Public Health a Global Cause." *Hospital Practice*, v. 8, September 1973: 205–211; 214–215; 218.

World Bank Group. *Health; Sector Policy Paper*. Washington, 1975. 83 p.

Includes topics dealing with: health in developing countries; causes of poor health; approaches to health policy; health policy for the future; and World Bank funding for health related projects.

World Health Organization. *Evaluation of Food Additives, Fifteenth Report of Joint FAO/WHO Experts*. Technical Report. Series No. 488 (FAO/UN report no. 50.)

Assesses food additives in baby foods and other issues relating to food additives.

World Health Organization. *Human Development and Public Health. Report of a WHO Science Group*. Geneva, 1972. 40 p. (Technical Report 485.)

World Health Organization. *International Drug Monitoring. The Role of National Centers. Report of a WHO Meeting*. Geneva, 1972. 47 p. (WHO Tech. Report 498.)

World Health Organization. "Occupational Health Programs." *WHO Chronicle*, v. 26, Dec. 1972: 537–546.

Based on a report presented by the Director General of the World Health Organization to the 25th World Health Assembly.

World Health Organization. *Implications of Individual and Small Group Learning Systems in Medical Education. Report of WHO Study Group*. Geneva, 1972. 29 p. (World Health Organization Technical Report 489.)

Assesses how the WHO can assist in developing learning materials and disseminating them.

World Health Organization. "National Drug Policies." *WHO Chronicle*, v. 29, Sept. 1975: 337–349.

Addresses questions of drug problems and policies; pleads for national government to establish drug policies to handle questions of safety and efficacy.

World Health Organization. *Research on the Biomedical Aspects of Fertility Regulation and on the Operational Aspects of Family Planning Programmes*. New York, United Nations, 1974. 29 p. (E/CONF.60/CBP/22.)

Deals with the WHO role in the world population conference.

World Health Organization. *Reviews of Family Planning Aspects of Family Health, With Special Reference to UNICEF/World Health Organization Assistance*. New York, United Nations, 1972. 40 p. (E/ICEP/L. (218).)

Reviews the joint activities of the World Health Organization and UNICEF regarding development of common health policies.

World Health Organization. *World Social Situation, 1974. Report*. New York, United Nations, 1974. 16 p. (E/CN.5/512/Add. 12.) UNESCO.

This is part 2, which addresses sectoral development in public health.

NATURAL RESOURCES

A. Minerals and Raw Materials

Canfield, Monte E., Jr. and John R. Hadd. "Government Response to Commodity Shortages." *Annals of the American Academy of Political and Social Science,* v. 420, July 1975: 60–71.

"The federal government was ill-prepared to deal with the fuel, food and nonenergy materials "shortages" experienced in the early 1970s. Future shortages may well be anticipated, due not only to depletion of available stocks, but also perhaps to economic (pricing), political (supply disruption), and limited production capacity factors. Annually, the United States is becoming more dependent upon foreign sources of supply. As the international scene has become more volatile and unstable, thereby increasing the vulnerability of foreign supply sources, overall domestic exploration has declined. New planning mechanisms are required if governmental capability to forecast and deal with either gradual or abrupt changes in supply or price is to be achieved. Alternative futures analysis is seen as a useful tool in the creation and implementation of a viable nonenergy materials policy."

Dinsmore, John H., *Raw Materials: Crisis for the 70's* (an annotated bibliography of selected U.S. Government publications concerning the national and international raw materials situation). Monticello, Ill., 1975. 16 p. (Council of Planning Librarians. Exchange bibliography 879).

Fox, William. *Tin: The Working of a Commodity Agreement.* London, Mining Journal Books, 1974. 418 p.

"With commodity problems on people's minds, this valuable book—probably the only account of a commodity agreement by one who played a key part in administering it for many years—has great current interest. While discreet, Mr. Fox is quite frank about mistakes and conflicts of views and restrained in his assessment of the buffer stocks, export controls and other devices of the tin agreements. Some of the most interesting passages concern the Soviet Union's sales of Chinese tin in the 1950s and the Tin Council's relations—sometimes cooperative and sometimes adversative with that large outsider with the stockpile, the United States." (1)

Howe, James W. *Interdependence and the World Economy.* [New York, Foreign Policy Association, 1974] 63 p. (Headline series, No. 222)

Contents: A New Era; Major Factors; Institutional Problems, New Global Problems, The Need for International Cooperation, and Politics for the United States.

Deals especially with raw materials.

"International Aspects of Materials Policy." Chap. 9 In U.S. Congress. *Material Needs and the Environment: Today and Tomorrow: Final Report of the National Commission on Materials Policy.* In compliance with section 201 of Title II of Public Law 91–512. June 1973. 93d Cong., 2d sess. Senate document no. 93–97. Washington, U.S. Govt. Print. Off., 1974, various parts.

The substance of this chapter indicates, in part, that "The forces of the marketplace, subject to considerations of public policy, have historically served the Nation well in providing sufficient supplies of materials at reasonable prices. Market forces must thus continue to be the prime determinant of the mix of domestic production and imports. The role of public policy as caretaker of the national interest, however, must be enlarged. In analyzing the circumstances of any material, considerations of the health and viability of domestic industry, national security, and fair international competition must all enter into the determination of when to rely upon the market and when to modify its operation. In this context, energy materials (particularly petroleum and natural gas) deserve special attention."

Kissinger, Henry A. "U.N. Session on Raw Materials and Economic Development." In Remarks of Hubert H. Humphrey. *Congressional Record* [daily ed.] v. 120, Apr. 23, 1974: S6103–S6105.

Reproduces Secretary Kissinger's address to the Apr. 15, 1974, session of the U.N. special session on raw materials.

Mikesell, Raymond F. "Nonfuel Minerals: U.S. Investment Policies Abroad." *The Washington Papers*, vol. III, no. 23, Sage Publications, 1975. 95 p. Available from the State Dept. as FAR 22401-P.

Rogers, Joseph B. "A Decade of International Cooperation." *Soil Conservation*, v. 38, Aug. 1972: 3-6, 14-15.

For 10 years the Soil Conservation Service has been sharing its knowledge of soil and water conservation with foreign countries. Summarizes this decade of international aid in conservation.

Smith, David N. and Louis T. Wells, Jr. "Mineral Agreements in Developing Countries; Structures and Substance." *American Journal of International Law*, v. 69, July 1975: 560-590.

Mineral production in most developing countries is still carried out through contractual arrangements between foreign firms and host country governments. The article explores some of the recent innovations in the structure of agreements.

Takeuchi, Kenji and Bension Varon. "Commodity Shortages and Changes in World Trade." *Annals of the American Academy of Political and Social Science*, v. 420, July 1975: 46-59.

"The healthy expansion of trade relations experienced throughout the postwar era has recently been interrupted. During the 1973-74 economic boom, there were widespread shortages of commodities. As the world economy has plunged into a deep recession, most of the commodity shortages have disappeared. Looking ahead for the next 10 years or so, when the world economy returns to a path of normal growth, are we likely to see widespread chronic commodity shortages? An analysis of prospective market conditions leads us to conclude: (1) that we are not on the threshold of an era of chronic and widespread commodity shortages; (2) that, indeed, the trade picture that emerges is not favorable for developing countries; (3) that the absence of global shortages in most primary commodities in the coming decade points up the soundness of interdependence through trade; and (4) that while trade has not so far benefited all participants equitably—and this situation should be corrected in the future—trade should not be strained to the point of breakdown by treating it as the only means for correcting all the inequities among nations."

Theberge, James D. "A Mineral Raw Materials Action Program." *Foreign Policy*, no. 17, winter 1974-1975: 75-79.

Recommends that the United States establish new structures to deal with the threat of mineral raw materials collusion from Third World producers.

U.S. Congress. Senate. Committee on Agriculture and Forestry. Subcommittee on Agricultural Credit and Rural Electrification and Subcommittee on Foreign Agricultural Policy. *U.S. and World Fertilizer Outlook*. 93d Cong. 2d sess. Washington, U.S. Govt. Print. Off., 1974. 205 p. (Committee print.)

Compilation of two studies and other materials dealing with fertilizer stocks and impacts on trade and agriculture.

U.S. Council on International Economic Policy. *Special Report: Critical Imported Materials*. December 1974. Washington, U.S. Govt. Print. Off., 1974. 49 p. plus appendix 61 p.

Prepared by an interagency task force under the direction of the CIEP and the National Security Council, in response to a Presidential directive to identify and assess potential threats to supplies of critical raw materials.

United Nations. Secretary-General (Waldheim). *Problems of Availability and Supply of Natural Resources: Medium-term and Long-term Projections of Reserves, Supply and Demand of Energy, Mineral and Water Resources: Progress Report.* [New York] 1975. 14 p. (United Nations. [Document] E/C.7/52/Add. 1.)

United Nations. Secretary-General (Waldheim). *Problems of Availability and Supply of Natural Resources: Survey of Current Problems in the Fields of Energy and Minerals, Overview of the World Energy Situation: Report.* [New York] 1975. 20 p. (United Nations. [Document] E/C.7/50) At head of title: United Nations Economic and Social Council.

Partial contents.—The petroleum exporting developing countries.—The special situation of the oil-importing developing countries.

United Nations. Secretary-General (Waldheim). *Projections of Natural Resources Reserves, Supply and Future Demand.* [New York] 1973. 4 v. (United Nations. [Document] E/C.7/40) At head of title: United Nations Economic and Social Council.

"Consists of an introduction, and three parts issued as addenda, dealing respectively with energy, mineral and water resources."

Varon, Bension and Kenji Takeuchi. "Developing Countries and Non-fuel Minerals." *Foreign Affairs*, v. 52, no. 3, April 1974: 497–510.

Analysis of possibilities of developing producer's alliances modeled on OPEC for non-fuel minerals, bauxite, and phosphate rock.

Woodbury, Wendell W. "The U.S., Japan, and Latin America's Mineral Resources." Case study prepared for the Sixteenth Session of the Senior Seminar in Foreign Policy, U.S. Dept. of State, 1973–1974: 14 p. Available from the State Dept. as FAR 19855-S.

B. GENERAL ISSUES

Barraclough, Geoffrey. "Wealth and Power: the Politics of Food and Oil." *New York Review of Books*, v. 22, Aug. 7, 1975: 23–30.

Essay on the role of food and oil in economic relations between the developed countries, led by the U.S., and the developing countries.

Bergsten, C. Fred. "The Threat From the Third World." *Foreign Policy*, no. 11, summer 1973: 102–124.

Assesses U.S. policies toward the "third world," with rich raw materials in light of objectives of "third world nations."

Brown, Lester R. *The Global Politics of Resource Scarcity.* [Washington, Overseas Development Council] 1974. 48 p. (Overseas Development Council. Development paper 17.)

Briefly notes factors contributing to the shortage of several key resources—water, oceanic fisheries, waste absorptive capacity, energy, minerals, food, fertilizer, timber—and examines the effects of global resource scarcity on the economic and political relationships among countries.

Brown, Lester. "Rich Countries and Poor in a Finite, Interdependent World," *Daedalus*, v. 102, fall 1973: 153–164.

Examines briefly 3 of the resources on which global economic activity depends: fresh water, oceanic protein, and waste absorptive capacity. Now the expansion of economic activity is pressing against the limits of the Earth's resources. The problem of how those resources which are in limited supply are divided among countries is becoming a critical international political issue.

Connelly, Philip and Robert Perlman. *The Politics of Scarcity: Resource Conflicts In International Relations.* London. Published for the Royal Institute of International Affairs by Oxford University Press, 1975. 162 p.

Assesses ". . . the international implications of recent changes in the ownership, supply, cost, and consumption of the world's natural resources." The book includes a survey of the physical and economic background to the resources problem. "The main focus, however, is upon the often contentious policy choices now faced, individually or in concert, by particular groups of countries; those with surplus resources to export, those which are self-sufficient, and those . . . which must depend on others for their vital raw materials. . . . [The authors] are clear in their view that neither economic hardship nor international conflict will be avoided in the future unless efficient national management is combined with the co-operative international exercise of a coherent political will by the producers and consumers of resources alike."

Cooper, R. N. "Natural Resources and National Security." *Resources Policy*, v. 1, June 1975: 192–203.

Believes that "the problem of resource scarcity is not so serious as has often been supposed lately . . . and there are relatively conventional means to increase our capacity to deal with possible short-run scarcities."

Gillette, Robert. "Endangered Species: Moving Toward a Cease-fire." *Science*, v. 179, March 16, 1973: 1107–1109.

"The agreement formally initiated by the United States and 79 other nations on 2 March (eight delegations were not empowered to sign) establishes a worldwide system of export and import permits designed to ban all commercial trade in 375 species or genera judged to be on the verge of extinction."

Guttenberg, Albert Z. and Raffaella Y. Nanetti. "Transnational Land Use: Toward a Conceptual Framework and Taxonomy of Issues." *Land Economics*, v. 50, Feb. 1974: 3–14.

"This exploratory paper reports on the results of one phase of a project in international planning research conducted cooperatively by the authors at the University of Illinois in Urbana-Champaign and at the University of Michigan at Ann Arbor. It is intended as a first step in the direction of a conceptual framework for transnational land use planning."

Howe, James W. *The U.S. and World Development: Agenda for Action, 1975.* New York, Praeger [1975] 276 p. (Praeger special studies in international economics and development.)

Partial contents.—Focus on the Fourth World, by H. Low and J. Howe.—Next Steps Toward Global Food Security, by L. Brown and E. Eckholm.—Trade Initiatives and Resource Bargaining, by G. Erb.—The OPEC Nations: Partners of Competitors?, by J. Grant.—The Emerging Challenge: Global Distribution of Income and Economic Opportunity, by R. Hansen.

"This volume is the third in the Agenda for Action series prepared annually by the Overseas Development Council."

Malenbaum, Wilfred. "Scarcity: Prerequisite to Abundance." *Annals of the American Academy of Political and Social Science*, v. 420, July 1975: 72–85.

"The article argues that today's food, energy, materials and overall national product scarcities are not caused by limitations of the earth's material endowments, but rather follow from man's limited horizon and limited performance. There is ample scope for continuous progress, particularly in the poor lands of the world. The real problem is the political will of man, operating through his private and public institutions, to create economic, legal and social conditions that encourage the expansion of individual participation in productive activity and that enhance each individual's capacity to contribute to national progress."

Mikdashi, Zuhayr, Stephen D. Krasner, and C. Fred Bergsten. "One, Two, Many OPEC's . . . ?" *Foreign Policy*, no. 14, spring 1974: 56–90.

The assertion of economic and political power by OPEC oil-producing nations has raised the prospect that certain developing countries may be able to exercise similar control over other natural resources, particularly mineral resources. Three authors look at this problem.

Morgan, Anne, Janice Baker, Warren Donnelly, Harvey Sherman, and Steve Hughes. *The Development and Allocation of Scarce World Resources: Selected Excerpts and References Relating to the National Debate Topics for High Schools 1975–1976.* May 1975. 399 p. Issued as Senate document no. 94–45, 94th Cong., 1st sess.

Natural resources/Resource allocation/Raw materials/Food supply/Nutrition policy/Energy consumption/Power resources/International co-operation/Economic growth/International economic relations.

Okita, Saburo. "Natural Resource Dependency and Japanese Foreign Policy." *Foreign Affairs*, v. 52, no. 4, July 1974: 714–724.

Economic, political, diplomatic and resource utilization and conservation strategies are discussed.

Piper, August, Jr. "Ecology: an Issue For Third World People?" *Black Scholar*, v. 6, May 1975: 23–31.

Author discusses resource depletion, modern war, pollution and food/population as areas in which present policies are leading humanity toward worldwide disaster.

Rostow, W. W. "The Developing World in the Fifth Kondratieff Upswing." *Annals of the American Academy of Political and Social Science*, v. 420, July 1975: 111–124.

"The current world economic situation seems to fit the cyclical 40- to 50-year commodities pricing pattern first identified by N. P. Kondratieff. If the pattern continues as it has for the past two centuries, the world, after the price surge of 1972–75 in foodstuffs, energy and raw materials, will experience a high and erratic protracted plateau for perhaps 20 years and then return to relatively low levels. However, we may be in the early stages of a major confrontation between man and the physical limits of growth on this planet.

Conventional Keynesian economics no longer suffice in this context. Research and development must be given highest priority, nationally and internationally, and new patterns of investment must be created. This will require international attitudes of solidarity and communal action policies to balance inequities in life quality for the benefit of both developed and developing nations. Cooperation in resource expansion and conservation, technological development, food production, birth control and trade relationships, to name a few major areas, is essential. An international partnership is a minimum condition for the survival of modern industrial civilization."

SEDAG Mekong Development Panel Seminar. Pattaya Thailand, August 1974. Paper available from the State Dept. as FAR series.

Includes agriculture (FAR 20490-P); local development institutions (FAR 20493-P); agriculture in the Mekong basin (FAR 20495-P); agriculture in Vietnam (FAR 20496-P); and land taxation (FAR 20497-P).

Slivitzky, Michel. "The Results of the International Hydrological Decade." ***Nature and Resources***, v. 10, Oct.-Dec. 1974: 5-10.

Sums up the achievements of the International Hydrological Decade. Hydrology/International Hydrological Decade, 1965-1974.

"The Question of the U.S. Role in Allocation of Scarce World Resources." *Congressional Digest*, v. 54, Aug.-Sept. 1975: 193-224.

Contents.—The U.S. and world resources scarcities.—Should the U.S. participate in internationally-controlled allocation of world food reserves to needy nations? pros and cons.—Is the proposed pursuit of U.S. "Energy Independence" a sound national policy?

Trade in Primary Commodities: Conflict or Cooperation? A Tripartite Report by Fifteen Experts from Japan, the European Community, and North America. Washington, D.C., The Brookings Institution, December 1974. 41 p.

Includes optimistic conclusions on the outlook for future supplies of minerals, food, and other primary commodities apart from oil, derived at a meeting held in October 1974 by fifteen private experts from Japan, Western Europe, and North America held in Tokyo, October 1974.

U.S. Congress. House. Committee on Banking and Currency. *Developing Countries and the United States in the World Economy: Problems and Prospects.* Report of the Ad Hoc Committee on the Domestic and International Monetary Effects of Energy and Other Natural Resource Pricing. 93d Cong., 2d sess., December 1974. Washington, U.S. Govt. Print. Off., 1974. 73 p. Committee print.

"This study examines how recent changes in the world economy—higher oil prices, higher prices for other primary commodities, inflation, and the slowdown of growth in industrialized countries—have created an immediate need in many developing countries for additional external capital. The amount of capital required and the prospects for obtaining it are both discussed. Longer term responses to the current economic situation—increased cooperation or more cartels—are also outlined. Major policy problems are identified and recommendations are developed."

Part five of a six-part series.

U.S. Congress. House. Committee on Foreign Affairs. *Global Commodity Scarcities in an Interdependent World.* A report by the Subcommittee on Foreign Economic Policy, Dec. 23, 1974. 93d Cong. 2d sess. Washington, U.S. Govt. Print. Off., 36 p. (Committee print.)

U.S. Congress. House. Committee on Foreign Affairs. Subcommittee on Foreign Economic Policy. *Global Scarcities in an Interdependent World,* Hearings, 93d Cong., 2d sess., May 1974. Washington, U.S. Govt. Print. Off., 1974. 259 p.

"Hearings . . . on changes in the access to and assurance of energy, minerals, and agricultural commodities supplies, and on adjustments needed in U.S. economic policies and international trading relations to adapt to current economic realities. Assesses impact on developed and developing nations of scarcities and higher prices, and possible measures to offset them."

U.S. Department of State. *World Wildlife Conference: Efforts to Save Endangered Species.* [Washington, U.S. Govt. Print. Off.] 1973. 30 p. (U.S. Dept. of State publication 8729.)

A plenipotentiary conference to conclude an international convention on trade in certain species of wildlife was held in Washington February 12-March 2. Following are remarks made by Secretary of the Interior Rogers C. B. Morton on February 12, a message from President Nixon read by Secretary Morton that day, and statements made on February 12 and

March 2 by Russell E. Train, Chairman, Council on Environmental Quality, who was head of the U.S. delegation, together with the report of the U.S. delegation, excerpts from the final act of the conference, and the text of the Convention on International Trade in Endangered Species of Wild Fauna and Flora.

U.S. Library of Congress. Congressional Research Service. *Treaties and Other International Agreements on Fisheries, Oceanographic Resources, and Wildlife to Which the United States is Party.* Prepared at the request of Honorable Warren G. Magnuson, Chairman, Committee on Commerce, United States Senate. Washington, U.S. Govt. Print. Off., 1974. 968 p. At head of title: 93d Cong., 2d sess. Committee print.

Prepared with the assistance of Marjorie Ann Browne and Brenda M. Branaman of Foreign Affairs, Division, CRS.

United Nations. Economic and Social Council. Committee on Natural Resources. *Report on the Fourth Session* (24 March–4 April 1975). New York, United Nations, 1975. 43 p. (United Nations. Economic and Social Council. Official records, 59th sess. Suppl. no. 3) United Nations. [Document] E/5663 United Nations. [Document] E/C. 7/56

Partial contents.—The United Nations revolving fund for natural resources exploration.—Water resources development.—Permanent sovereignty over natural resources.

United Nations. Secretary-General (Waldheim). *Comprehensive Plan of Action For and Coordination of Programmes Within the United Nations System in the Field of Natural Resources Development: Report.* [New York] 1975. 23 p. (United Nations. [Document] E/C.7/47/Add.1) At head of title: United Nations Economic and Social Council.

Presents an overview of the United Nations system as a whole in the field of water resources.

United Nations. Secretary-General (Waldheim). *Co-ordination of the Work of the United Nations System in the Natural Resources Field and Progress in the Implementation by the United Nations System of the Guidelines for Action in the Development of Natural Resources.* [New York] 1972. 31 p. (United Nations. [Document] E/c. 7/38/Add. 1) At head of title: United Nations Economic and Social Council.

Discusses "areas of agreement and problems of interagency co-operation."

United Nations. Secretary-General (Waldheim). *Co-ordination of the Work of the United Nations System in the Natural Resources Field and Progress in the Implementation by the United Nations System of the Guidelines for Action in the Development of Natural Resources.* [New York] 1972. 9 p. (United Nations. [Document] E/C. 7/38/Add. 3) At head of title: United Nations Economic and Social Council.

Discusses "measures to co-ordinate the programmes of the organizations and agencies of the United Nations system."

United Nations. Secretary-General (Waldheim). *Co-ordination of the Work of the United Nations System in the Natural Resources Field and Progress in the Implementation by the United Nations System of the Guidelines for Action in the Development of Natural Resources: Work Programmes, Spheres of Competence, Division of Responsibilities and Co-ordination Measures: Report.* [New York] 1972. 78 p. (United Nations. [Document] B/C.7/38)

At head of title: United Nations Economic and Social Council.

United Nations. Secretary-General (Waldheim). *Developments in the Field of Natural Resources—Water, Energy and Minerals; Recommendations of the United Nations Conference on the Human Environment Relating to Natural Resources.* [New York] 1972. 5 p. (United Nations. [Document] E/C.7/32) At head of title: United Nations Economic and Social Council.

International environmental cooperation—Conferences/Conservation of natural resources/Power resources/United Nations Conference on the Human Environment, Stockholm, 1972.

United Nations. Secretary-General (Waldheim). *Developments in the Field of Natural Resources—Water, Energy and Minerals: Technical and Economic Aspects of International River Basin Development: Report.* [New York] 1972. 1 v. (various pagings) (United Nations. [Document] E/C.7/35) At head of title: United Nations Economic and Social Council.

International rivers/International environmental cooperation/Water resources development—Finance.

United Nations. Secretary-General (Waldheim). *Developments in the Field of Natural Resources—Water, Energy and Minerals: (United Nations Water Conference: Report.)* [New York] 1973. 9 p. (United Nations. [Document] E/C.7/39) At head of title: United Nations Economic and Social Council.

Discusses the desirability, cost, and proposed agenda for a United Nations Water Conference.

United Nations. Secretary-General (Waldheim). *United Nations Revolving Fund for Natural Resources Exploration: Report.* [New York] 1975. 15 p. (United Nations. [Document] DP/53/Rev. 1) At head of title: United Nations Development Programme.

"The Fund will provide a form of cooperation in the field of natural resources to developing countries additional to the assistance available to these countries through projects financed under their country programmes within their indicative planning figures (IPFs), or through regional or interregional projects when appropriate."

Wolfgang, Marvin E. editor, "Adjusting to Scarcity." *Annals of the American Academy of Political and Social Science,* v. 420, July 1975.

The articles reprinted in the volume were presented at the 79th annual meeting of the American Academy of Political and Social Science, April 1975. In introducing the articles, the editor notes: "Whether certain commodities are truly in scarce natural supply relative to current use and demand, or are available in amounts limited by political and economic pressures, was one of the major issues considered by the participants. . . . The contributors did not agree about: (1) the existence of scarcity; (2) the particular commodities believed to be in short supply; (3) the reasons for shortages; or (4) whether, or how, society should make adjustments to perceived scarcity."

The articles are entitled: "Population and scarcity of food," "Food, fertilizer, and the new global politics of resource scarcity," "Natural distribution of metals and some economic effects," "Commodity shortages and changes in world trade," "Government response to commodity shortages," "Scarcity: prerequisite to abundance," "Petroleum and energy," "A Creative adaptation to a world of rising shortages," and "The developing world in the fifth Kondratieff upswing."

OCEAN RESOURCES AND POLICY

A. General Issues

Borgese, Elisabeth Mann and David Krieger, eds. *The Tides of Change.* New York, Mason/Charter, 1975. 357 p.

"Brings together a wide variety of papers regarding international ocean policy prepared in the 1971–73 period, but still timely."

Brenner, Michael. "The Intergovernmental Oceanographic Commission and the Stockholm Conference: A Case of Institutional Non-Adaption." *International Organization,* v. 29, no. 3, summer 1975: 771–804.

"This article considers how an established international organization with responsibility for programs of pure and applied science adapts its organizational format and purposes to newly defined tasks. It examines the institutional response of IOC (the Intergovernmental Oceanographic Commission) to the specification of new obligations in the environmental field as stipulated by the United Nations Conference on the Human Environment, and as developed by the Environmental Program that the Conference established. Its main theme is the place of specialized knowledge, and the role of experts at the various stages of policy formation, within national governments and international forums. In analyzing the adaptation of IOC through expert and non-expert activities, our aim is to determine whether new programs and initiatives are fitted to the existing framework, or produce new structures and institutional arrangements."

Burke, William T. *National and International Law Enforcement in the Ocean.* Report prepared for INR/XR, U.S. Dept. of State, March 1975. 275 p. Available from the Dept. of State as FAR 22339–S.

Conference on Conflict and Order in Ocean Relations, Airlie House, 1974. *Perspectives on Ocean Policy.* [Washington, National Science Foundation, for sale by the Supt. of Docs., U.S. Govt. Print. Off., 1975] 435 p.

Ocean policy—Conferences/Maritime law/Regionalism (International organization)/Marine resources/Sea power/Territorial waters/United Nations Conference on the Law of the Sea, 3d, New York and Caracas, 1973–1974.

Cotrell, Alvin J. "Iran and the Indian Ocean: Geopolitics Beyond the Persian Gulf." Paper, March 1975. 16 p. Available from the State Department as FAR 21874–P.

Franssen, Herman T. "Understanding the Ocean Science Debate." *Ocean Development and International Law Journal,* v. 2, no. 2, 1974: 187–202.

The author feels that developing countries "are not likely to relinquish sovereign rights over parts of their claimed 'national territory' for a vague promise of technical assistance."

Galey, Margaret E. "The Intergovernmental Oceanographic Commission: Its Capacity to Implement an International Decade of Ocean Exploration." Occasional Paper No. 20, University of Rhode Island, Law of the Sea Institute, December 1973, 38 p. Available from the State Department as FAR 22498–P.

Galey, Margaret E. "The International Seabed Authority As a Creator of Grants." Paper presented at the Annual Meeting of the International Studies Association, Washington, D.C., February 1975. 57 p. Available from the State Dept. as FAR 22413–P.

Gray, Oscar S. *International Responsibility of States for Environmental Damage with Particular Reference to Damage Arising From Non-Navigational Uses of International Waters.* Report prepared for the U.S. Dept. of State, April 1974. 96 p. Available from the State Dept. as FAR 19449–S.

Handler, Philip. "Statement by Dr. Philip Handler, President, National Academy of Sciences of the United States of America, before Subcommittee III, on the Peaceful Uses of the Sea-Bed and the Ocean Floor, Mar. 29, 1973." In Remarks of Warren G. Magnuson. *Congressional Record* [daily ed.] v. 119, May 8, 1973: S8530–S8532.

Statement urging international cooperation in oceanography and strong national support for research funding.

Hardy, Michael. "International Control of Marine Pollution." In Fawcett, J.E.S. and Rosalyn Higgens, eds. *International Organization: Law in Movement: Essays in Honour of John McMahon*. London, New York, Oxford University Press, 1974. p. 103-141, 160-175.

Contents.—Classification of the main forms of marine pollution.—The existing legal framework.—International proposals and discussions.—A pattern of needs and of possible solutions.

Hollick, Ann L. and Robert E. Osgood. *New Era in Ocean Politics*. Baltimore, John Hopkins Press, 1974. 112 p.

"Since 1967, the United States Government has been actively engaged in formulating policy for the control and use of the oceans. The central questions to be resolved relate to the allocation and use of ocean space. Of paramount importance in international relations as well, these issues of ocean politics are now being considered by the United Nations Conference on the Law of the Sea. The political issues confronted here include the question of an international regime for the seabed, the breadth of territorial area, the nature and extent of coastal economic zones, straits used for international navigation, and maritime environment. Ann Hollick describes these basic issues and relates them to U.S. ocean policymaking. Robert Osgood then examines the central concern of U.S. policy—the relation of the prospective law of the sea treaty to U.S. security interests in the control and use of oceans. These papers were produced as part of the Ocean Policy Project of the SAIS, an ongoing program that will be analyzing the more enduring aspects of ocean policy as it develops. (Supported by NSF RANN award: GI-39643.)

Juda, Lawrence. *Ocean Space Rights: Developing U.S. Policy*. New York, Praeger, 1975. 300 p.

"The starting point of this analytical narrative of expanding American claims of jurisdiction over the continental shelf is the Truman proclamation of 1945. Includes documentary appendices." (1)

Luttwak, Edward N. *The Political Uses of Sea Power: a Theoretical Analysis of the Political Application of Military Force*. Baltimore, Johns Hopkins University Press, 1974. 79 p.

"In this innovative study, Luttwak defines the purposes for which naval power is used by each of the great powers. He outlines the distinct modes in which political effects are generated, relating these to specific cases and instances of naval forces for purely political ends. He produces a framework that takes account of different types of naval and military maneuvers, as well as domestic, local, regional, and international considerations."

Pisarov. V. D. "Soviet-American Cooperation in World-Ocean Studies." *USA: Economics, Politics, Ideology*, no. 10, Oct. 1974: 7-19.

Prescott, J. R. V. *The Political Geography of the Oceans*. New York, Halsted Press, 1975. 247 p.

"An exposition of the geographical factors and problems associated with the extension of state sovereignty over the seas and the seabed.

Schatcher, Oscar, and Daniel Serwer. *Marine Pollution Problems and Remedies*. New York, United Nations Institute for Training and Research. 1970. 41 p. (UNITAR research report # 4.)

Shinn, Robert A. *The International Politics of Marine Pollution Control*. New York, Praeger, 1974. 220 p.

Traces development and status of marine pollution in international law, identifies primary interest groups and forums, and analyzes proposals now before the international community.

Quester, George H. ed. *Sea Power in the 1970s: A Symposium Sponsored by the Cornell University Program on Peace Studies*. Dunellen, 1975. 248 p.

"In just a decade the Soviet Union has surfaced as the world's second greatest sea power. What United States response to this situation should be is the subject of this symposium, which presents nine expert opinions from a variety of fields, ranging from the Navy itself, to applied physics, to international law.

"What are the dangers of overreaction or underreaction to Soviet sea power? The precise nature of the Soviet buildup is examined in numbers and technology, submarines and surface vessels, merchant and armed ships, and nuclear and conventional weaponry. Polaris missile-type submarines receive special attention. Individual essays examine the balance of power in three key areas: the Mediterranean, Indian Ocean, and Far East. The vital issues of oil transport and fishing rights, and the naval capabilities of other nations such as Britain, France, Japan, and China, are also considered.

"The participants in this symposium are sometimes at loggerheads, but they present all the important facts and most cogent arguments in what is already a controversial armament issue of the seventies."

Oceanographic research/Marine pollution—Research/International cooperation in science/Marine resources—Research.

United Nations. *The Sea: A Select Bibliography on the Legal, Political, Economic and Technological Aspects, 1974–1975.* New York, United Nations, 1975. E/F. 75.I.7.

United Nations. Secretary-General (Waldheim). *Marine Co-operation: Report.* [New York] 1973. 7 p. (United Nations. [Document] E/5332) At head of title: United Nations Economic and Social Council.

United Nations. Secretary-General (Waldheim). *Uses of the Sea.* [New York] 1972. 12 p. (United Nations. [Document] E/5120) At head of title: United Nations Economic and Social Council.

U.S. Congress. House. Committee on Merchant Marine and Fisheries. Subcommittee on Oceanography. *Oceanography Miscellaneous.* Hearings, September and December 1974, 93d Cong., 2d sess. Washington, U.S. Govt. Print. Off., 1975. 327 p.

Hearings ". . . to receive State Department briefings on establishment of the Bureau of Ocean Affairs and International Environmental and Scientific Affairs, and on progress at the third U.N. Law of the Sea Conference."(3)

U.S. Congress. Senate. Committee on Commerce. Subcommittee on Oceans and Atmosphere. *International Conference on Ocean Pollution.* Hearings, 92d Cong., 2d sess. Oct. 18 and Nov. 8, 1971. Washington, U.S. Govt. Print. Off., 1972 126 p.

U.S. Congress. Senate. Committee on Commerce. Subcommittee on Oceans and Atmosphere. *Intervention on the High Seas Act: Report to Accompany S. 1070.* Washington, U.S. Govt. Print. Off., 1973. 6 p. (93d Cong., 1st sess. Senate. Report no. 93–482)

Oil pollution of the sea—Treaties/International environmental cooperation/International Convention relating to Intervention on the High Seas in Cases of Oil Pollution Casualties.

U.S. Congress. Senate. Committee on Commerce. Subcommittee on Oceans and Atmosphere. *Ocean Dumping Convention Implementation; Report on H.R. 5450.* (93d Cong., 2d sess. Senate Report no. 93–726.) Washington, U.S. Govt. Print. Off., 1974, 21 p.

U.S. Congress. Senate. Committee on Commerce. Subcommittee on Oceans and Atmosphere. *Oil Pollution Act Amendments of 1973; Report to Accompany H.R. 5451.* Washington, U.S. Govt. Print. Off., 1973. 14 p. (93d Cong. 1st sess. Senate. Report no. 93–405.)

U.S. Congress. Senate. Committee on Foreign Relations. *Convention on the Prevention of Marine Pollution.* Sen. Exec. Rept. 93–13. 93d Cong. 1st sess. Aug. 1, 1973. Washington, U.S. Govt. Print. Off., 1973. 5 p.

Recommends Senate ratification of the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter. The convention would establish national systems to regulate ocean wastes disposal.

U.S. Congress. Senate. Committee on Foreign Relations. *Seabed Arms Control Treaty.* Hearings, 92d Cong., 2d sess., Jan. 27, 1972. Washington, U.S. Govt. Print. Off., 44 p.

Hearings to receive testimony and views about the Senate's ratification of the Treaty on the Prohibition of the Emplacement of Nuclear Weapons and Other Weapons of Mass Destruction the Seabed and the Ocean Floor.

U.S. Congress. Senate. Committee on Foreign Relations. *U.S. Oceans Policy: Report to accompany S. Res. 82.* Washington, U.S. Govt. Print. Off. 1973. 6 p. (93d Cong. 1st sess. Senate. Report no. 93–296.)

U.S. Congress. Senate. Committee on Foreign Relations. Subcommittee on Oceans and International Environment. *Conventions and Amendments Relating to Pollution of the Sea by Oil.* Hearings, 92d Cong. 1st sess., on Executive G, 91st Cong., 2d session. May 20, 1971. Washington, U.S. Govt. Print. Off., 1971. 229 p.

U.S. Congress. Senate. Committee on Foreign Relations. Subcommittee on Oceans and International Environment. *International Compensation Fund for Oil Pollution Damage.* Hearings, 93d Cong., 1st sess., on Executive K, 92d Cong., 2d sess. and S. 841. Apr. 17 and 18, 1973. Washington, U.S. Govt. Print. Off., 1973. 202 p.

Hearings to consider: (1) the International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage, Brussels, Dec. 18, 1971; The 1971 Amendment to the International Convention for the Prevention of the Pollution of the Sea by Oil (tanker size); and the bill S. 841, to implement legislation for the Fund Convention.

U.S. Library of Congress. Congressional Research Service. *Soviet Ocean Activities: a Preliminary Survey.* Prepared at the request of Hon. Warren G. Magnuson, Chairman, Committee on Commerce and Hon. Ernest F. Hollings, Chairman, National Ocean Policy Study for the use of the Committee on Commerce and the National Ocean Study Policy pursuant to S. Res. 222. Washington, U.S. Govt. Print. Off., 1975. 81 p. At head of title: 94th Cong., 1st sess. Committee print.

"The report includes most of the important salient aspects of Soviet ocean activities such as: fisheries, transportation, oceanography, deep-sea mining, underwater activities, oil and gas developments on the Outer Continental Shelf and Soviet response to marine pollution problems. The report concludes with a chapter on the implications of Soviet ocean policy on U.S. policy."

U.S. National Science Foundation. Office of the International Decade of Ocean Exploration. *International Decade of Ocean Exploration: Program Description.* Washington [1973] 57 p. "Second report."

Wenk, Edward, Jr. *The Politics of the Ocean.* Seattle, University of Washington Press, 1972. 590 p.

"This book . . . rang[es] . . . through every facet of U.S. ocean policy over the past twenty years. The book is also a primer on bureaucratic, administrative and organizational politics . . . from firsthand observation. Dr. Wenk assesses the strengths and weaknesses of every interest group, cognizant agency, congressional committee, White House officer and the general public as they bear on ocean policy." Emphasizing the politics and bureaucratic tension surrounding resolution of oceans policy issues, the author organized the book into three broad subjects. It first examines the generation and development of U.S. ocean policy; a middle section covers the principal substantive issues that occupied the attention of the Marine Science Council, of which Wenk was Executive Secretary; and the final part of the book projects implications and postulates future management avenues for marine policy. These include the author's assessment of problems facing the recently created (1970) National Oceanic and Atmospheric Administration and extensive suggestions for U.S. leadership in the international development of ocean resources. (5)

Wooster, W. S., "Interactions Between Intergovernmental and Scientific Organizations in Marine Affairs." *International Organization,* v. 27 Winter 1973: 103–113.

B. OCEAN RESOURCES

Adams, M. V., and others. *Mineral Resource Management of the Outer Continental Shelf.* [Washington, U.S. Geological Survey] 1975. 32 p. (U.S. Geological Survey. Circular 720)

"Leasing procedures, evaluation of resources, and supervision of production operations on leased lands of the Outer Continental Shelf."

Barkenbus, Jack N. "International Implications of Manganese Module Mining." *World Affairs,* v. 136, spring 1974: 306–320.

Blews, Maj. Monte E. (U.S. Air Force). "Treasures of the Deep—Potential for International Conflict." Report Air Command and Staff College, Air University, May 1974. 69 p. Available from the State Dept. as FAR 20794–G or as AD 920 536 L.

Doumani, George A. *Ocean Wealth: Policy and Potential.* Rochelle Park, N.J., Hayden Book Co., 1973. 285 p.

Defines resources, technologies and economics of seabed; policy; international concern; role of science and technology. Contains relevant appendices.

Heck, Carles B. "Collective Arrangements for Managing Ocean Fisheries." *International Organization*, v. 29, no. 3, summer 1975: 711–744.

"With the great spread and intensification of marine fisheries exploitation, the traditional fisheries regime of free and open access (part of traditional "freedom of the seas") has been modified by many regional or stock-related management arrangements, and is now undergoing drastic change through a radical extension of coastal state jurisdictions. This article deals mostly with the development of various regional and stock-related arrangements. After sketching the overall purposes of management, the article details some of the differences among competing states which have delayed or limited management arrangements, or otherwise complicated their development. Issues of allocation may be uppermost for competing interests, discussed here in the context of shifts from undivided to divided catch limits. The regulatory powers of intergovernmental fisheries commissions have generally been quite limited. While fisheries scientists have in some cases performed vital roles in encouraging regional arrangements, their information and advice has been of limited scope and influence in securing more restrictive regulatory regimes. FAO's Committee on Fisheries (COFI) might be called a global fisheries commission, though much of its most important work has related to animating and supporting arrangements of a regional character. The radical shift outward of national jurisdictions is rearranging fisheries exploitation in most parts of the world. Given the nature of the resource, however, some forms of regional or stock arrangements will still be needed if the overall purposes of management are to be realized."

Jacobs, Michael J. "United States Participation in International Fisheries Agreements." *Journal of Maritime Law and Commerce*, v. 6, July 1975: 471–529.

The article reviews international fisheries agreements now in force to which the United States is a party. Deals with the current status of the agreement and highlights some of the key issues relative to the agreement and its implementation in the United States.

Johnson, Barbara. "Technocrats and the Management of International Fisheries." *International Organization*, v. 29, no. 3, Summer 1975: 745–770.

"The paper examines the role of the world's fishery technocrats and experts in international fisheries management. The system of management provided by the regionally based international fisheries commissions is organized on transgovernmental and transnational lines. Political delegates to the commissions are usually government technocrats, suggesting that the system is basically transgovernmental. However, the role of scientific advisers to the commissions is studied, since the group may preempt political control through its control on expertise. Results of a questionnaire sent to 900 scientists throughout the world are given, using the data from a structured sample of 84 scientists. Most were found to be trained as natural scientists, and most were employed directly by national governments or through government research institutes. 'Elite' scientists in the group, and some executive heads of commissions were also analyzed, and found to have a generally cautious approach to problems of fishery ownership and management. In sum, the transgovernmental system itself was found to allow yet set the limits of transnational role playing by fishery experts."

Knight, H. G. ed. *The Future of International Fisheries Management.* St. Paul Minn., West Publishing Co. (Under the auspices of the American Society of International Law.) 1975. 253 p.

National Research Council. Panel on Operational Safety in Marine Mining. *Mining in the Outer Continental Shelf and in the Deep Ocean.* Washington, National Academy of Sciences, 1975. 119 p.

"The study undertakes . . . to examine the potential of the resource, evaluate the state of the art of ocean mining, identify the legal, regulatory, and jurisdictional problems involved, consider the possible environmental questions, and determine how to meet the needs for trained engineers to do the job."

McLin, Jon. "Resources and Authority in the North-East Atlantic. Part II: Fisheries Conservation." [Hanover, N.H.] American Universities Field Staff [1973] 13 p. (*American Universities Field Staff. Fieldstaff Reports.* West Europe series, v. 8, no. 6 [General])

"The exercise of conservation authority over fishing activities in North-West Europe dates at least from the tenth century. Today the ICES-NEAFC machinery embodies a serious attempt to base international policy on scientific understanding. But the real test is just beginning."

McLin, Jon. "Resources and Authority in the North-East Atlantic; Part III: Oil and Gas." [Hanover, N.H.] American Universities Field Staff, 1973. 12 p. (*American Universities Field Staff. Fieldstaff Reports.* West Europe series, v. 8, No. 8 [General])

"Offshore petroleum exploration and production in the North Sea and other parts of the European continental shelf are experiencing a boom which is still expanding. The European Community, and especially Norway and the United Kingdom, must devise policies for settling jurisdictional disputes and managing their new-found wealth."

Peterson, Russell W. *OCS Oil and Gas—Environmental Assessment. Report to the President by the Council on Environmental Quality.* Washington, April 1974. 341 p.

Smith, Wayne J. "International Control of Deep Sea Mineral Resources." *Naval War College Review,* v. 24, June 1972: 82–90.

A majority of nations appear to regard deep sea resources as "the property of all mankind." Focusing on manganese nodules as a resource, the author asserts that only by addressing first the fundamental question of how to bring deep sea minerals onto the international market without upsetting world metal prices can agreement be reached in this area.

Shapley, Deborah. "Law of the Sea: Energy, Economy Spur Secret Review of U.S. Stance." *Science,* v. 183, Jan. 25, 1974: 290–292.

"At the urging of the Treasury Department, U.S. officials preparing for the United Nations Law of the Sea conference are conducting a drastic reassessment of previously stated United States positions on issues ranging from offshore oil and gas development to international environmental policy."

United Nations. Secretary-General (Waldheim). *Additional Notes on the Possible Economic Implications of Mineral Production From the International Sea-bed Area: Report.* [New York] 1972. 34 p. (United Nations. [Document] A/AC. 138/73) At head of title: United Nations General Assembly.

Ocean floor/Marine resources/Mines and mineral resources.

United Nations. Secretary-General (Waldheim). *Economic Implications of Sea-bed Mining in the International Area: Report.* [New York] 1975. 17 p. (United Nations. [Document] A/CONF. 62/37) At head of title: United Nations. At head of title: Third conference on the Law of the Sea.

Focuses on policy issues in the context of the Law of the Sea Conference. Emphasis is upon issues associated with the mining of manganese modules.

United Nations. Secretary-General (Waldheim). *Marine Questions: Coastal Area Management and Development: Report.* [New York] 1975. 19, 7 p. (United Nations. [Document] E/5648) At head of title: United Nations Economic and Social Council.

"The report, in defining and underscoring the importance of coastal areas on a global scale, endeavors to set forth the main phases of a planning approach for managing and developing those areas for the benefit of developing coastal states."

United Nations. Secretary-General (Waldheim). *Marine Questions: Uses of the Sea.* [New York] 1975. 1 v. (various pagings) (United Nations. [Document] E/5650) At head of title: United Nations Economic and Social Council.

Partial contents.—Exploitation of marine resources.—Uses of ocean space.—Research and support services.—Summary of existing arrangements in the United Nations system for disseminating information on advances in marine technology and for the transfer of such technology.

United Nations Source Documents on Seabed Mining. Compiled by the Editors of Ocean Science News. Washington, Nautilus Press, 1974. 391 p.

"The documents contained in this volume are in all cases reproductions of the originals—as delivered in Caracas, the summer of 1974; made available in New York City by the U.N.; or gathered in various places by the reporters and editors of *Ocean Science News.* No attempt has been made to edit the documents, merely to shorten them where the repetition is obvious."

U.S. Congress. House. Committee on Foreign Affairs. Subcommittee on Inter-American Affairs. *Fishing Rights and United States-Latin American Relations.* Hearing, 92d., Cong., 2d sess. Feb. 3, 1972. Washington, U.S. Govt. Print. Off., 1972. 128 p.

Appendix 3—The Latin American-United States Fishing rights controversy, with specific reference to Chile, Ecuador and Peru, by Virginia M. Hagen. LRS multilith F-356.—Appendix 4—The Latin American-United States fishing rights controversy; dilemma for United States foreign policy (1969–1971). LRS multilith 71-117 F.

U.S. Congress. House. Committee on Merchant Marine and Fisheries. Subcommittee on Oceanography. *Deep Seabed Hard Minerals.* Hearings, 93d Cong., 1st sess., on H.R. 9 and H.R. 7732; and 93d Cong., 2d sess., on H.R. 12233. March 1, 28, 29, April 3, 1973; and February 26–28, 1974. Washington, U.S. Govt. Print. Off., 1974. 513 p.

Hearings on bills to promote the conservation and orderly development of hard mineral resources of the deep seabed, pending adoption of an international regime relating thereto.

Includes "Deep-sea minerals: background analysis for legislation" by Nancy P. Peterson and John R. Justus of the Science Policy Research Division, Congressional Research Service, p. 333–354.

U.S. Congress. Senate. Committee on Commerce. *The Economic Value of Ocean Resources to the United States.* Prepared at the request of Hon. Warren G. Magnuson . . . pursuant to S. Res. 222, National Ocean Policy Study, 93d Cong., 2d sess. Washington, U.S. Govt. Print. Off., 1974. 109 p. (Committee print.)

Estimates the current and projected value to the United States of all ocean resources, 1972–1973 and projected to 1985 and 2000. Contract performed by Robert Nathan Associates, for the Congressional Research Service.

U.S. Congress. Senate. Committee on Commerce. *Fisheries Management Under a 200-Mile Jurisdictional Limit.* 94th Cong., 1st sess. Washington, U.S. Govt. Print. Off., 1975: 23 p. (Committee print.)

"A primer on fisheries management under the 200-mile extended jurisdiction. The study describes the existing situation of U.S. fisheries, notes the values of fisheries to the Nation, presents some of the alternative suggestions for change of the management structure, and raises some of the jurisdictional and management problems which may arise under extended fisheries jurisdiction." Prepared by Mark Zilberberg, Ocean and Coastal Resources Project, CRS.

U.S. Congress. Senate. Committee on Interior and Insular Affairs. Special Subcommittee on Outer Continental Shelf. *Outer Continental Shelf.* Report by the Special Subcommittee on OCS. December 21, 1970. Washington, U.S. Govt. Print. Off., 1971. 224 p. At head of title: 91st Cong., 2d sess. Committee print.

Contains an evaluation of several policies and proposals relating to the continental shelf and deep seabed based on the record of hearings (in 3 pts.) on the Outer Continental Shelf. Legal and political aspects of the OCS boundary controversy; economic and conservation considerations re alternative OCS boundary locations; interim policy; the Administration's proposals, and numerous appendices.

U.S. Congress. Senate. Committee on Interior and Insular Affairs. Subcommittee on Minerals, Materials and Fuels. *Mineral Resources of the Deep Seabed.* Hearings, 93d Cong. 1st sess. on S. 1134. May 17, and June 14, 15, 18, 19, 1973. Part 1. Washington, U.S. Govt. Print. Off., 1973. 768 p.

Hearings on legislation to promote the conservation and orderly development of the hard mineral resources of the deep seabed, pending adoption of an international regime therefor.

U.S. Congress. Senate. Committee on Interior and Insular Affairs. Subcommittee on Minerals, Materials and Fuels. *Mineral Resources of the Deep Seabed.* Hearings, 93d Cong. 2d sess. On Amendment no. 946 to S. 1134. March 5, 6, and 11, 1974. Part 2. Washington, U.S. Govt. Print. Off., 1974. 769–1355 p.

Continuation of hearings on legislation to promote the conservation and orderly development of the hard mineral resources of the deep seabed, pending adoption of an international regime therefor.

U.S. Congress. Senate. Committee on Interior and Insular Affairs. Subcommittee on Minerals, Materials and Fuels. *Recent Developments in Deep Seabed Mining.* Report. April 1975. 94th Cong. 1st sess. Washington, U.S. Govt. Print. Off., 1975. 41 p. Committee print.

Analysis of a briefing to the committee by the Dept. of the Interior on deep seabed mineral resources, preparatory to the Law of the Sea Conference.

U.S. National Science Foundation. Office for the International Decade of Ocean Exploration. *Ferromanganese Deposits on the Ocean Floor.* David R. Horn (ed.). Papers from a conference. Lamont-Doherty Geological Observatory, Columbia University, Palisades, New York, January 20–22, 1972. 293 p.

"The collected papers in this volume are contributions which define the 'state of the art' in important areas of manganese nodule research . . . and identify major problems which will require further study."

Working Group on Living Marine Resources. *Principles of a Global Fisheries Management Regime.* Studies in Transnational Legal Policy, No. 4, May 1974: 29 p.

"Sets forth principles agreed to by an expert interdisciplinary working group of the Society for the use of the Law of the Sea Conference and others concerned with the rational management of the Living Resources of the Sea. The principles concern the rationale, goals, and components of a management regime, dispute avoidance, and problems of enforcement." The Group was composed of members of the American Society for International Law. Supported by NSF RANN award: GI-29927.

C. LAW OF THE SEA CONFERENCE

Brown, Seyom and Larry Brown. "Diplomats at Sea." *Foreign Affairs,* v. 52, no. 2, Jan. 1974: 301-321.

Discusses factors which should enter into the U.S. position at the 1974 Law of the Sea Conference. "In its unfolding ocean diplomacy, the United States must face two realities: it will not get all that it wants, and it will have to cooperate intensively with many other nations in order to get what it can . . . . This Conference must leave future ocean negotiators with a legacy of accommodation and mutual trust in ocean affairs, not a residue of bitterness left by confrontationist diplomacy."

Christy, Francis T., Jr., et. al. *Law of the Sea: Caracas and Beyond.* Cambridge, Ballinger, 1975. 416 p.

Contains the proceedings of the Ninth Annual Conference, Law of the Sea Institute.

Friedheim, Robert L. and Mary E. Jehn. "Anticipating Soviet Behavior at the Third U.N. Law of the Sea Conference; U.S.S.R. Positions and Dilemmas." Professional paper 124, August 1974. 45 p. Available from the State Dept. as FAR 20152-P.

Friedmann, Wolfgang. *The Future of the Oceans.* New York, George Braziller, 1971. 132 p.

Presents case against expanding national claims to large offshore areas, and discusses freedom of the seas; creeping jurisdiction; marine resources; Truman Proclamation; Geneva Convention; and Third Law of the Sea Conference.

Goldie, L. S. E. "International Law of the Sea: a Review of States' Offshore Claims and Competences." *Naval War College Review,* v. 24, Feb. 1972: 43-66.

"The problems of formulating effective concepts for managing states' offshore claims and competences is well appreciated by the international community. . . . Here, the author reviews many of the essential rules, legal fictions, and institutions that deal with the problem, and also examines some of the novel claims that states have made in their effort to exercise exclusive authority over offshore areas."

Hollick, Ann L. "What to Expect From a Sea Treaty." *Foreign Policy,* no. 18, spring 1975: 68-80.

Summary of issues to be discussed at the mid-March 1975 conference. Law of the Sea Institute. University of Rhode Island. "Law of the Sea Briefing: Reflections on the Caracas Session of the United Nations Law of the Sea Conference." Occasional Paper no. 24, partially supported by NOAA, ONR, and USCG, December 1974. 47 p. Available from the State Department as FAR 22495-P.

Lay, S. Houston, Robin Churchill, and Myron Nordquist. *New Directions in the Law of the Sea.* Dobbs Ferry, New York, Oceana Publications, Inc., The British Institute of International and Comparative Law, London, 1973, vol. I, 502 p.

Collection of documents on national legislation; bilateral and multilateral agreements; territorial seas; fishing limits; fishery conservation zones; OCS; pollution; regulation of marine activities; high seas; military activities; and seabed activities.

Logan, P. M. *Canada, the United States, and the Third Law of the Sea Conference.* [Montreal] Canadian-American Committee [1974] 122 p.

". . . A study that would provide a background survey of the major issues at the Conference, the Canadian and U.S. positions on these issues, and bilateral Canada-U.S. offshore concerns."

Logue, John. (ed.) *The Fate of the Oceans.* Villanova, Pennsylvania, Villanova University Press, 1972. 237 p.

U.N. debates; pollution; law of the sea; U.S. system and the ocean regime.

Lovald, Johan Ludvik. "In Search of an Ocean Regime: The Negotiations in the General Assembly's Seabed Committee 1968–1970." *International Organization*, v. 29, no. 3, summer 1975: 681–710.

"This study deals with the opening phase of the U.N. negotiations concerning the future international regime for ocean space. It seeks to establish how the technological and economic capabilities of member nations condition the manner and style of negotiation, the definition of national objectives, and the growth of attitudes and expectations with regard to such a regime. By the end of the 1968–70 period expectations about the future international regime had narrowed noticeably. Yet, for long-range tactical reasons many delegations were still holding out in anticipation of a new Law of the Sea Conference. The original Maltese seabed proposal envisaged a comprehensive international regime. In general, developing countries favored such a solution in the beginning, while industrialized countries preferred an intermediate solution. Eventually the Maltese proposal and the negotiating situation inadvertently set off a wave of claims for various forms of national jurisdiction. This meant that the emphasis at the end was more on the rights of the coastal states and less on the capacity of the world community to deal collectively with the future of ocean space."

Marine Scientific Research and the U.N. Law of the Sea Negotiations. Report of the U.S. National Committee for SCOR (Scientific Committee on Oceanic Research of the International Council of Scientific Unions). Washington, D.C., U.S. National Committee for SCOR, Ocean Affairs Board, National Research Council, 1974. 12 p.

Maechling, Charles, Jr., "Freedom of Scientific Research: Stepchild of the Oceans." *Virginia Journal of International Law.* v. 15, spring 1975: 539–559.

Survey of the general issues before the Law of the Sea Conference with specific attention paid to freedom of scientific research in the oceans.

Ocean Affairs Bibliography, 1971: A Selected List Emphasizing International Law, Politics, and Economics of Ocean Uses. Washington D.C., Woodrow Wilson International Center for Scholars. September 1971. 201 p. (Oceans Series no. 302)

"The bibliography is intended to be selective and to concentrate on recent material essential to an understanding of the present state of international law and ocean uses and major proposals to extend the coverage of law and sound cooperative practices in the uses of the oceans."

The bibliography is organized by subject matter and partially annotated.

Perspectives on Ocean Policy. Prepared by the Ocean Policy Project. Johns Hopkins University. Papers presented at the Conference on Conflict and Order in Ocean Relations, Airlie, Va., October 1974. Prepared for the National Science Foundation, USC/FAR Proj. no. 19222–73. 435 p. Available from the State Dept. as FAR 22267–G.

Contains discussions and papers relating to economics, political, geographical, and other aspects of the Law of the Sea.

United Nations. *Third United Nations Conference on the Law of the Sea. Official Records, Vol. I: Summary Records of Meetings.* New York, United Nations, 1975. E. 75. V. 3.

U.S. Comptroller General. *Information on United States Ocean Interests Together With Positions and Results of Law of the Sea Conference at Caracas.* Report of March 6, 1975. ID–75–46.

"The report assesses U.S. positions taken at the Caracas session of the Law of the Sea Conference and identifies types of problems that U.S. negotiators will have to deal with during future sessions.

"The conference considered main trends on major issues, including territorial seas, economic zones, straits, fisheries, continental margins, marine scientific research, and dispute settlement."

U.S. Congress. House. Committee on Foreign Affairs. *Endorsing Objectives for a Just and Effective Ocean Treaty: Report to Accompany H. Res. 330.* Washington, U.S. Govt. Print. Off., 1973. 3 p. (93d Cong., 1st Sess. House. Report no. 93–96)

"The purpose of House Resolution 330 is to endorse ocean policy objectives now being pursued by the United States delegation to the United Nations Seabed Committee toward agreement on a just and effective ocean treaty at the forthcoming Law of the Sea Conference, to commend the delegation for its excellent work, and to encourage the delegation to continue to work diligently for early agreement on the treaty."

U.S. Congress. House. Committee on Foreign Affairs. *Status of the U.N. Law of the Sea Conference.* Hearings, Nov. 19, 1974, 93d Cong. 2d sess. Washington, U.S. Govt. Print. Off., 1975. 49 p.

U.S. Congress. House. Committee on Foreign Affairs. Subcommittee on International Organizations and Movements. *Law of the Sea Resolution.* Hearings 93d Cong., 1st sess., on H. Res. 216 and 296, Mar. 21 and 27, 1973. Washington, U.S. Govt. Print. Off., 1973. 187 p.

U.S. Congress. Senate. Committee on Commerce. *The Third U.N. Law of the Sea Conference.* Prepared by the Congressional Research Service, Library of Congress at the request of the Committee on Commerce and the National Ocean Policy Study pursuant to S. Res. 222. 94th Cong., 1st sess. Washington, U.S. Govt. Print. Off., 1975. 66 p. (Committee print.)

Essentially a primer on the Third Law of the Sea Conference, "the study includes references to pre-treaty law making, the 1958 and 1960 Conferences on the Law of the Sea, the preparatory conferences on the law of the sea, the New York and Caracas sessions of the Third Law of the Sea Conference, administration policy formulation, congressional views on the law of the sea negotiations, and the role of the Senate in treaty-making in general and the Law of the Sea Treaty in particular."

U.S. Congress. Senate. Committee on Commerce. Subcommittee on Oceans and Atmosphere. *Law of the Sea.* Hearings, 92d Cong., 2d sess. Oct. 3, 1972. Washington, U.S. Govt. Print. Off., 1972. 137 p. "Serial No. 92–79".

Discusses topics for the 1973 Law of the Sea Conference, among them "fishing jurisdiction, scientific research, marine pollution, breadth of the territorial sea, passage through straits, and the international regime for the deep seabed. . . ."

U.S. Congress. Senate. Committee on Foreign Relations. *U.S. Oceans Policy.* Hearing, 93d Cong., 1st sess., and on S. Res. 82. June 19, 1973. Washington, U.S. Govt. Print. Off., 1973. 95 p.

Reviews activities of the Executive branch preparatory to the Law of the Sea Conference.

U.S. Congress. Senate. Committee on Foreign Relations. *Third U.N. Law of the Sea Conference.* 94th Cong. 1st sess. Feburary 5, 1975. Washington, U.S. Govt Print. Off., 1975. 85 p. (Committee print.)

"Report to the Senate by the advisers to the U.S. Delegation to the Third U.N. Law of the Sea Conference in Caracas during June–Aug. 1974. Contains background, major conference issues, and an overall summary."

U.S. Congress. Senate. Committee on Interior and Insular Affairs. *The Law of the Sea Crisis.* A staff report on the U.N. Seabed Committee, the outer continental shelf, and marine mineral development. Prepared at the request of Henry M. Jackson, Chairman. December 1971. Washington, U.S. Govt. Print. Off., 1972. 328 p. At head of title: 92d Congress, 1st session. Committee print.

A report of observations and developments at the July–August 1971 sessions of the United Nations Seabed Committee.

U.S. Congress. Senate. Committee on Interior and Insular Affairs. Subcommittee on Minerals, Materials and Fuels. *Status Report on Law of the Sea Conference.* Hearing, 93d Cong. 1st sess. September 19, 1973. Washington, U.S. Govt. Print. Off., 1973. 819 p.

Hearing held to receive a status report from the U.S. Delegation to the Summer 1973 Geneva U.N. Seabed sessions preparatory to the 3d U.N. Conference on Law of the Sea.

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Maritime law—Conferences/Marine resources—Conferences/United Nations Conference on the Law of the Sea, 3d, New York and Caracas, 1973–1974.

U.S. Congress. Senate. Committee on Interior and Insular Affairs. Subcommittee on Minerals, Materials and Fuels. *Status Report on Law of the Sea Conference.* Hearing, 94th Cong., 1st sess. June 4, 1975. Part 3. Washington, U.S. Govt. Print. Off., 1975. p. 1161–1422.

Maritime law—Conferences/Marine resources—Conferences/United Nations Conference on the Law of the Sea, 3d, New York and Caracas, 1973–1974.

Vambery, Joseph T. The Law of the Sea: a Selective Bibliography of Articles, Documents and Monographs. *Columbia Journal of Transnational Law,* v. 13, no. 1, 1974: 173–186.

THE PEOPLE'S REPUBLIC OF CHINA: COOPERATION AND SCIENTIFIC AND TECHNOLOGICAL INFRASTRUCTURE

Akhtar, Shahid. *Health Care in the People's Republic of China: a Bibliography with Abstracts.* Report, IDRC-038 e, 1975. 182 p. Available from the State Department as FAR 21679-P.

Brown, Harrison. "Scholarly Exchanges With the People's Republic of China." *Science*, v. 183, Jan. 11, 1974: 52–54.

Craig, Jack. *China: Domestic and International Telecommunications, 1949–74. In China: a Reassessment of the Economy; a compendium of Papers Submitted to the Joint Economic Committee*, Congress of the United States. Washington, U.S. Govt. Print. Off., 1975. p. 289–310.

Contents.—Historical development.—Organization and management.—Status of transmission media.—Telecommunication modes and services.—International telecommunications.—Broadcasting system.

Dean, Genevieve C. "Science, Technology and Development: China as a Case Study." *China Quarterly*, no. 51, July–Sept. 1972: 520–534.

Economic development—[China]/Technological innovations—[China]/Science policy—[China].

Dean, Genevieve C. *Science and Technology in the Development of Modern China: an Annotated Bibliography.* Product of a workshop cosponsored by the Joint Committee on Contemporary China, and the University of Sussex Science Policy Research Unit and the Canadian International Research Center, January 1972. London, Mansell, 1974. 279 p.

Dernberger, Robert F. "The Transfer of Technology to China." *Asia Quarterly* no. 3, 1974: 229–252.

Deshingkar, G. D. "Science and Technology in China: a Preliminary Enquiry." *China Report*, v. 10, Sept.-Dec. 1974: 69–90.

A report on the development of science and technology in China which seeks to build on the old Chinese practices to form their own independent scientific base.

Directory of Selected Scientific Institutions in Mainland China. Prepared by Surveys and Research Corporation. Stanford, California, Hoover Institution Public Series no. 96, 1970. 469 p.

"This volume attempts to present the organization of research and development in the People's Republic of China in the period prior to the Cultural Revolution. It contains information about 490 selected scientific institutions concerned with the physical, biological, medical, and agricultural sciences."

"The East is Read." *Nature*, v. 256, Aug. 21, 1975: 608–610.

Analysis of China's principle scientific journal *Scientia Sinica*, indicates that the cultural revolution had little effect on China's international scientific tradition.

Harrison, Selig S. "Time Bomb in East Asia." *Foreign Policy*, no. 20, fall 1975: 3–27.

Presents some of the preliminary findings of a year-long study of China's oil policy. Investigation conducted on behalf of the Carnegie Endowment for International Peace. "Already, by drawing only on its onshore reserves and those of Po Hai Gulf, Peking appears likely to reach the current production level of Saudi Arabia by 1988 or soon thereafter."

Liao, T. R. "Science in China." *LC Science Tracer Bullet*, June 1975: 1–12. Washington, D.C. Library of Congress.

Neilan, Edward, and Charles R. Smith. *The Future of the China Market—Prospects for Sino-American Trade.* Washington, D.C., American Enterprise Institute for Public Policy Research, 1974. 95 p.

Orleans, Leo A. "China's Population: Can the Contradictions be Resolved?" *In China: a Reassessment of the Economy; a Compendium of Papers Submitted to the Joint Economic Committee*, Congress of the United States. Washington, U.S. Govt. Print. Off., 1975. p. 69–80.

Concludes that "Peking does not really know the size of China's population or the precise rate at which it is growing . . . There are no accurate statistics in demographic estimates on Chinese population."

Orleans, Leo A. "China's Science and Technology; Continuity and Innovation." In U.S. Congress. Joint Economic Committee. *People's Republic of China: An Economic Assessment: a Compendium of Papers.* 92d Cong., 2d sess. Washington, U.S. Govt. Print. Off., 1972. Joint Committee Print. pp. 185–219.

Review of China's policies for science and technology before and after the cultural revolution. ". . . China continues to 'walk on two legs' in science and technology, just as she has been doing in many other fields. Although she is placing great emphasis on local industries and what may be termed local science and technology, China continues to expand her urban economy and to compete with the advanced countries in the modern industrial sector and in advanced science and technology."

The Prospects for U.S.-China Relations. National Committee on United States-China Relations. New York, 1975.

"A report of a National Committee conference held in May 1974 which brought together 30 specialists in Chinese affairs and foreign policy. It summarizes and focuses on recent political developments, areas of potential conflict in foreign policy goals, and key issues facing the People's Republic of China and the United States."

Rifkin, Susan B. "The Chinese Model for Science and Technology: Its Relevance for Other Developing Countries." *Technological Forecasting and Social Change,* v. 7 no. 3, 1975: 257–271.

"This paper examines the growth of an indigenous scientific and technological capability through self-reliance (the 'Chinese model')."

Shih, Joseph A. "Science and Technology in China." *Asian Survey,* v. 12, Aug. 1972: 662–675.

"This article attempts to summarize the general condition of science and technology in the People's Republic of China during the past twenty years. From this, we may be able to forecast the future trend, and . . . be able to gain some understanding of the interplay of technology and ideology."

Suttmeier, Richard P. "Chinese Scientific Societies and Chinese Scientific Development." *Developing Economics,* v. 11, June 1973: 146–163.

Suttmeier, Richard P. "Research and Revolution." *Science Policy and Societal Change in China.* Lexington, Mass., Lexington, (Heath) 1974. 190 p.

"A major aspect of science policy in China after 1949 has been its continual change. More precisely, China has not pursued a single science policy since the People's Republic was founded. Rather, its policies have varied so over time that it makes sense to speak of six science policies: 1949–1952, 1953–1957, 1958–1960, 1961–1966, 1966–1969, and 1970 to the present. Each is incisively summarized in this major evaluation of science policy in the People's Republic of China.

". . . The key to Suttmeier's analysis is his recognition that any set of science policies maximizes some goals but not others. Given China's traditional cultural, social, and economic inhibitions to scientific advance on the one hand and her low technological level on the other, any long-run science policy must attack the environmental constraints while enhancing the nation's storehouse of knowledge. . . . [These] tasks are not compatible over the short run. Hence a successful science policy in China—and perhaps in other underdeveloped countries as well—must be flexible and evolutionary." (2)

Suttmeier, Richard P. "Science Policy Shifts, Organization Change and China's Development." *China Quarterly,* no. 62, June 1975: 207–241.

"This paper is part of a larger forthcoming study entitled Research and Revolution: an Exploration Into Science Policy and Societal Change in China (Lexington, Mass.: Lexington Books)."

U.S. Congress. Joint Economic Committee. *China: A Reassessment of the Economy: A Compendium of Papers.* July 10, 1975. 94th Cong. 1st sess. Washington, U.S. Govt. Print. Off., 1975. 737 p.

"This is a compilation of invited papers designed to meet the interests of the committee and the Congress in an up-to-date body of factual data and interpretative comment on the state of the domestic economy of China, including the record of its recent experience in economic development and its relations with the outside world." Research papers were prepared by academics, staff of research institutions and Federal officials, including staff of the Library of Congress. The study was directed by John P. Hardt, of the

Congressional Research Service. Included among the topics assessed are economic policy, the defense burden, agriculture, transportation, industry, population, the environment, technology transfer, international trade, financing, Sino-Japanese economic relations, and foreign aid. A summary is included.

Among the papers, those that deal with science and technology as well as scientific and technological infrastructure are: "China's Population: Can the Contradictions Be Resolved?," Leo Orleans; "Balance in Coastal and Inland Industrial Development," Charles R. Roll, Jr. and Kung-Chia Yeh; "China's Environomics: Backing Into Ecological Leadership," Leo A. Orleans; "Civilian Industrial Production in the People's Republic of China: 1949–1974," Robert Michael Field; "The Chinese Petroleum Industry: Growth and Prospects," Bobby A. Williams, "China's Iron and Steel Industry," Alfred H. Usack, Jr., and James D. Egan; "China: Domestic and International Telecommunications, 1949–74," Jack Craig; "China: Agriculture in the 1970s," Alva Lewis Erisman; "Constraints Influencing China's Agricultural Performance," Dwight H. Perkins; "Rural Industrialization in China," Jon Sigurdson; "Acquisition and Diffusion of Technology in China," Han Heymann, Jr.

U.S. Congress. Senate. Committee on Foreign Relations. *China: a Quarter Century After the Founding of the People's Republic.* 94th Cong., 1st sess. Jan. 29, 1975. Washington, U.S. Govt. Print. Off., 1975. 91 p. (Committee print.)

"Report by Sen. Mike Mansfield . . . following his most recent visit to China, Dec. 9–30, 1974 on: Chinese progress in implementing its internal social and economic policies, with focus on health services and agriculture; U.S.–China relations, emphasizing issues relating to Taiwan and trade matters; and China's foreign policy."

U.S. Congress. Senate. Committee on Labor and Public Welfare. Subcommittee on Health. *Health Care in China, 1973.* Hearings, May 1973. Washington, U.S. Govt. Print. Off., 1973. 265 p.

To examine the state of medicine in the Peoples' Republic of China.

U.S. Congress. Senate. Committee on Labor and Public Welfare. Subcommittee on Health. *Health Policies and Services in China, 1974.* 93d Cong., 2d sess. Washington, U.S. Govt. Print. Off., 42 p. (Committee print.)

"Report prepared . . . by Leo A. Orleans, Library of Congress, examines current health services in China emphasizing the extent to which conditions have improved since 1948 through concentration on basic sanitation, preventive medicine, and the widespread use of paramedics." (3)

Whitson, William W. "China's Quest for Technology." *Problems of Communism,* v. 22, July–Aug. 1973: 16–30.

The author believes China will focus its attention on acquiring defense-related technology.

Williams, Bobby A. "The Chinese Petroleum Industry: Growth and Prospects." *In China: a Reassessment of the Economy: a Compendium of Papers Submitted to the Joint Economic Committee,* Congress of the United States. Washington, U.S. Govt. Print. Off., 1975. p. 225–263.

Wu, Yuan-li. "Chinese Technological and Economic Capabilities: is the PRC a Stabilizing or Destabilizing Influence?" *Orbis,* v. 17, fall 1973: 880–894.

"U.S. policymakers seem to have, in their own minds, ascribed to the PRC a balancing role on the Soviet Union's Far Eastern front." The article examines some of the assumptions implicit in envisaging such a role for Peking.

Wu, Yuan-li and Robert B. Sheeks, et. al. *The Organization and Support of Scientific Research and Development in Mainland China.* New York, Published for the National Science Foundation by Praeger Publisher's, 1970. 593 p.

Deals with: history of science and technology to 1969, formulation of goals and policy, trends in the structure of R and D, financing of R and D activities, users of funds for science, R and D institutions in operation, economic growth and the R and D effort, and various inventories of research and development.

PHYSICAL SCIENCES RESEARCH: COOPERATION

Abelson, Philip H. "A New International Program." *Science*, v. 182, no. 4108, Oct. 12, 1973. Editorial.

Describes the origins of a new international cooperative scientific project, the Geodynamics Project in earth sciences. This was initiated by scientists themselves. The author of the article describes how scientists are seeking government support for additional scientific research under the project.

Abelson, Philip H. "International Geophysics: Science Dominates Politics. (Discussion of the meeting of the International Union of Geodesy and Geophysics, by the chairman of the U.S. National Committee for Geophysics.)" *Science*, v. 190, October 3, 1975: 34-35.

Potential political obstacles to the meeting, which dealt with such politically sensitive topics as resources, development, natural hazards and pollution, were overshadowed by the useful exchange of information among the delegates. The author also reports on the poor representation by Soviet scientists and the position of scientists from the less developed countries in an international scientific meeting.

The Antarctican Society, ed. *Science, Technology, and Sovereignty in the Polar Regions.* Lexington, Massachusetts, Lexington Books, 1974. 240 p.

"Even as scientific and industrial activity increases in Antarctica and in the Arctic, territorial sovereignty and civil and criminal legal jurisdiction in the polar regions remain ambiguous, delicate matters of international political balance. This work is a critical commentary and reference work, extensively annotated, which examines polar developments and conflicts and their implications for both international law and U.S. law affecting transnational science and technology. It is the first guide to the dramatic lessons and issues of the law in the polar regions to have been prepared by legal scholars and science-policy specialists experienced in both polar regions and in problems of foreign policy and law of the sea. It is intended for use by diplomats, governmental officials, scientists, economists, political scientists and students of international law. Notes, tables, and appendixes."

Ronner, Felix. "International Co-operation in Geology." *UNESCO Chronicle*, v. 19, May 1973: 189-195.

Discusses an international program to establish the relationships between geological phenomena occurring at different periods in different world regions.

Scott, John T. "International Cooperation in Physics." *Physics Today*, v. 28, Jan. 1975: 69-71.

"Participants at AIP's (American Institute of Physics) Corporate Associates Meeting call for increased internationalism on a world-wide scale."

U.S. Congress. Senate. Committee on Foreign Relations. Subcommittee on Oceans and International Environments. *U.S. Antarctic Policy.* Hearings, 94th Cong. 1st sess. May 15, 1975. Washington, U.S. Govt. Print. Off., 1975. 112 p.

"Hearing . . . to review U.S. policy regarding mineral exploration and exploitation in the Antarctic."

U.S. Program for the Geodynamics Project: Scope and Objectives. U.S. Geodynamics Committee, Geophysics Research Board, Division of Earth Sciences and Division of Physical Sciences, National Research Council; in collaboration with the National Academy of Science, U.S. National Committee for the International Union of Geodesy and Geophysics for the International Union of Geological Sciences, and for the Scientific Committee on Oceanic Research, International Council of Scientific Unions. Washington, National Academy of Sciences, 1973. 248 p.

SPACE COOPERATION AND POLICY

"Apollo-Soyuz Test Project." *Space World.* v. 133. Jan. 1975: 21-27.

Describes the joint U.S.-U.S.S.R. space mission with diagrams and biographic sketches of the participants.

Bourgin, Simon. "Impact of U.S. Space Cooperation Abroad." In *Symposium on International Cooperation in Outer Space, 1971.* International cooperation in outer space: a symposium; prepared for the Committee on Aeronautical and Space Sciences, United States Senate. Washington, U.S. Govt. Print. Off., 1971. p. 163-172.

Bulban, Erwin J., and Craig Covault. "Special report: ASTP mission." *Aviation Week & Space Technology,* v. 102, May 5, 1975: 36-53.

A two-part special report on the joint Apollo-Soyuz Test Project flight scheduled for July 1975.

Davis, Philip C., and William G. Holder. "Keynote of the 1970s: Joint Ventures Into Space." *Air University Review,* v. 24, Sept.-Oct. 1973: 16-29.

U.S.-U.S.S.R. cooperation in space projects.

Draper, C. Stark, and Frank J. Malina. "International Academy of Astronautics (I.A.A.)" In *Symposium on International Cooperation in Outer Space, 1971.* International cooperation in outer space: a symposium; prepared for the Committee on Aeronautical and Space Sciences, United States Senate. Washington, U.S. Govt. Print. Off., 1971. p. 567-574.

"Europe and the Shuttle Programme." *Flight International,* v. 101, June 8, 1972: 831-832.

"It is now two years since the United States invited Europe to participate in its ambitious space transport system. Much reduced since then, the so-called shuttle programme now comprises the reusable Earth-to-orbit ferry vehicle, an orbit-to-orbit reusable tug, and a shuttle-borne laboratory—the sortie module. This article looks at the problems facing Europe as decision date approaches."

Fouquet, David. "Europe into Space: New European Space Agency Emphasizes U.S .Cooperation." *European Community,* no. 180, Oct. 1974: 19-21.

Frutkin, Arnold W. "International Cooperation in Space—What's Ahead?" *Aerospace,* v. 12, May 1974: 8-14.

The article focuses on the U.S.-U.S.S.R. Apollo-Soyuz mission then assesses the possibilities of other joint U.S.-Soviet cooperative ventures in space. The author, the Assistant NASA Administrator for International Affairs notes that joint cooperation probably is required for other future large space ventures. ". . . Such bases on the Moon would be too expensive for one country alone. . . . manned expeditions to Mars will likely be organized on an international basis. . . . By 1991 I anticipate that it will be clear to all that if it is desired to proceed on the major space missions of the future, there is no alternative to international cooperation—no alternative that is both feasible and appropriate in a world at peace."

Harvey, Dodd L. and Linda C. Ciccoritti. *U.S.-Soviet Cooperation in Space.* Monographs in International Affairs, Center for Advanced International Studies, University of Miami, 1974. 408 p.

A history of the U.S.-Soviet relationships in space prepared by presenting large extracts and excerpts from the official documents and media accounts of the formation of the relationships. The analytical interpretation provided by the authors enhances the cogency of the materials.

"International Cooperation in Outer Space." In *Stanley Foundation. Fifteenth Strategy for Peace: Conference Report. October 17-20, 1974.* Muscatine, Iowa, The Stanley Foundation, 1974: 55-64.

The following issues were discussed and debated: "What should be the foreign policy of the United States with regard to communication, remote sensing and other application satellites (economic, social, military, political and legal aspects)? What should be the role of international organization in the field of international cooperation in outer space?" The importance of international cooperation, as opposed to primarily unilateral initiatives was emphasized.

Lewis, Howard. "The Soviet Agreement: How It Was Put Together." *SPPSG [Science and Public Policy Studies Group] Newsletter*, v. 3, Aug.–Sept. 1972: 1–4.
Discusses the background to the October 1972 meeting between scientific representatives of the U.S. and U.S.S.R.

Packard, Robert F. "Space Activities in the State Department." In *Symposium on International Cooperation in Outer Space, 1971.* International cooperation in outer space: a symposium; prepared for the Committee on Aeronautical and Space Sciences, United States Senate. Washington, U.S. Govt. Print. Off., 1971. p. 55–63.

Porter, Richard W. "International Scientific Community: International Council of Scientific Unions and COSPAR." In *Symposium on International Cooperation in Outer Space, 1971.* International cooperation in outer space: a symposium; prepared for the Committee on Aeronautical and Space Sciences, United States Senate. Washington, U.S. Govt. Print. Off., 1971. p. 527–557.

Sedov, L. "International Cooperation in Space Exploration." *International Affairs*, no. 11, Nov. 1973: 16–21.
Soviet view of subject.

Shatalov, Vladimir. "Space Co-Operation." *New Times*, no. 19, May 1973: 3–4.
"Cooperation in space exploration is a notable aspect of the steadily expanding contacts between the U.S.S.R. and the U.S.A. The Soviet cosmonaut Major-General Vladimir Shatalov, who is a member of the joint Soviet-American working group engaged on the Soyuz-Apollo experimental space flight programme, answers questions. . . ."

Sheldon, Charles S. *United States and Soviet Programs in Space: Summary Data Through 1972 and a Forward Look.* Multilith, Science Policy Research Division, Congressional Research Service, January 29, 1973. 73 p. (73–69 SP.)
Summarizes Soviet and American accomplishments in space since 1957. Background comparisions are made contrasting and assessing the salient economic, military, technical, and political considerations which surround each nation's program.

Sheldon, Charles S. *United States and Soviet Progress in Space: Summary Data Through 1973 and A Forward Look.* Multilith, Science Policy Research Division, Congressional Research Service. January 8, 1974. 74 p. 74–35 SP.
An update of the series of multiliths which summarizes Soviet and American space programs since 1957.

Sheldon, Charles S. *United States and Soviet Progress in Space: Some New Contrasts.* Multilith, Science Policy Research Division, Congressional Research Service, January 12, 1971. 71 p. (71–25 SP.)
The multilith summarizes the accomplishments of the two major space powers, the United States and the Soviet Union, from 1957 and compares some of the salient economic, technical, military and political aspects of the two programs.

Sheldon, Charles S. II. *United States and Soviet Progress in Space: Summary Data Through 1974 and a Forward Look.* Multilith, Science Policy Research Division, Congressional Research Service, January 13, 1975. 87 p.
This is the 1975 updated version of the series of CRS multiliths which describe and compare Soviet and American space programs since 1957.

"Soviet Academy Hosts Congenial International Space Conference." *Astronautics & Aeronautics*, v. 11, Dec. 1973: 58–68.
Report on the first international space conference held in U.S.S.R.

Ulsamer, Edgar. "The U.S. Space Program Moves Toward New Frontiers." *Air Force Magazine*, v. 57, Mar. 1974: 62–69.
In an interview, the NASA Administrator reviews U.S. space program and future U.S.-U.S.S.R. cooperation.

United Nations. *Space Activities and Resources. A Review of the Activities and Resources of the United Nations, of Its Specialized Agencies and of Other Competent International Bodies Relating to the Peaceful Uses of Outer Space.* New York, United Nations 1972. E.72.I.11.

U.S. Comptroller General. *A Progress Report On United States-Soviet Union Cooperative Programs.* Report to the Congress, January 8, 1975. Washington, U.S. Govt. Print. Off., 1975. 98 p. ID–75–18.
The report is a comprehensive assessment of the accomplishments and bottlenecks surrounding the U.S.-Soviet cooperative programs which resulted from the 1972 agreement on scientific cooperation. The report finds generally that cooperation is probably as good as can be expected under the constraints of poor communications, differing priorities, misunderstandings, security

considerations, lack of appropriate funding, and other problems which have hindered the programs. Special attention is given to the science and technology agreement, cooperation in environmental protection and cooperation in space exploration.

U.S. Congress. House. Committee on Science and Astronautics. *Review of the Soviet Space Program With Comparative United States Data.* Report prepared by the Science Policy Research Division, Library of Congress. Washington, U.S. Govt. Print. Off., 1967. 138 p. (Committee print.)

The study is a ten-year review of the Soviet space program which makes relevant comparisons with corresponding programs in the United States. "The study is intended to throw as much light as possible on the scope and directions of the Soviet program, and also to provide a useful statistical reference to the Soviet program in comparison with the U.S. program."

It was prepared by Dr. Charles Sheldon. "It uses only unclassified open sources, both Soviet announcements and independent checks on such data derived from U.S. observational equipment whose findings are published in this country and from corresponding British data."

U.S. Congress. House. Committee on Science and Astronautics. Subcommittee on International Cooperation in Science and Space. *A General Review of the International Cooperation in Science and Space.* Hearings, 92d Cong., 1st sess. May 18, 19, 20, 1971. Washington, U.S. Govt. Print. Off., 1971. 359 p. "No. 4"

Statements presented by Federal officials responsible for international scientific and technological activities in various agencies address the following topics: nature and extent of international cooperative programs in science and space, perspective on functions, activities, and interrelationships of involved government agencies, understanding the problems and obstacles encountered in pursuing international cooperative ventures, and determination of prospects for future cooperation.

U.S. Congress. House. Committee on Science and Astronautics. *Space Shuttle, Space Tug, Apollo-Soyuz Test Project—1974; Status Report.* 93d Cong., 2d sess. Washington, U.S. Govt. Print. Off., 1974. 784 p. At head of title: Committee print. "Serial K"

Space shuttles—[U.S.]/Space propulsion—[U.S.]/Space policy—[U.S.]/Space policy—[U.S.S.R.]/Exchange of persons programs—[U.S.]/Exchange of persons programs—[U.S.S.R.]

U.S. Congress. House. Committee on Science and Astronautics. Subcommittee on Manned Space Flight. *Manned Space Flight—U.S.-Soviet Rendezvous and Docking.* Hearing, 92d Cong., 2d sess. May 31, 1972. Washington, U.S. Govt. Print. Off., 1972. 30 p.

U.S. Congress. Senate. Committee on Aeronautical and Space Sciences. *Convention on International Liability for Damage Caused by Space Objects Analysis and Background Data.* Staff Report. 92d Cong., 2d sess. Washington, U.S. Govt. Print. Off., 1972. 76 p. (Committee print.)

The report analyzes the Convention on International Liability for Damage Caused by Space Objects and reviews the steps which led to its adoption by the United Nations. It includes a brief review of congressional action on earlier space treaties. The report was prepared by the Congressional Research Service with the assistance of the Department of State.

U.S. Congress. Senate. Committee on Aeronautical and Space Sciences. *International Cooperation and Organization for Outer Space.* Staff Report. 89th Cong., 1st sess. Sen. Doc. no. 56. August 12, 1965. Washington, U.S. Govt. Print. Off., 1965. 580 p.

The document, which was prepared by Mrs. Eilene Galloway, Congressional Research Service, surveys organizations with space and space-related programs and their interrelationships. In particular it analyzes "the impact of the frontier of outer space upon U.S. foreign relations; bilateral and multilateral relationships among nations, the relationship between outer space and arms control; international economic, technical, and scientific developments; and politics and programs pursued within the United Nations and its specialized agencies. One of the main purposes of this study is to describe the structure and functioning of international institutions and the relation between national and international space activities to 1965."

U.S. Congress. Senate. Committee on Aeronautical and Space Sciences. *International Cooperation in Outer Space: A Symposium.* 92d Cong., 1st sess. Sen. Document 92-57, December 9, 1971. Washington, U.S. Govt. Print. Off., 1971. 732 p.

The symposium includes papers by 48 experts in international space activities. It was designed to give the committee up-to-date background information on activities which had occurred since the previous symposium volume was published in 1965. The articles deal with general issues in United States and international space cooperation; the United Nations and outer space; intergovernmental international space organization, the international scientific community and professional associations, and U.S. foreign relations and the future of international space cooperation.

U.S. Congress. Senate. Committee on Aeronautical and Space Sciences. *Soviet Space Programs, 1962–1965; Goals and Purposes, Achievements, Plans, and International Implications.* Staff report. 89th Cong. 2d sess. Dec. 30, 1966. Washington, U.S. Govt. Print. Off., 1966. 920 p. (Committee print.)

This background document was prepared by experts in the Library of Congress. One purpose was to update a previous report prepared in 1962. "The present study, as in the case of its predecessor, has sought to identify, insofar as possible, Soviet intentions, organizations, plans, capabilities and programs in space, to discuss certain aspects of Soviet space sciences and space technology, and to survey and analyze their international political and legal implications." No classified documents were used.

U.S. Congress. Senate. Committee on Aeronautical and Space Sciences. *Soviet Space Programs, 1966–1970: Goals and Purposes, Organizations, Resources, Facilities and Hardware, Manned and Unmanned Flight Programs, Bioastronautics, Civil and Military Applications, Projections of Future Plans, Attitudes Toward International Cooperation and Space Law.* Staff report prepared by the Science Policy Research Division and the Foreign Affairs Division of the Congressional Research Service and the European Law Division of the Law Library, Library of Congress. 92d Cong. 1st sess., Sen. Doc. No. 92–51. December 9, 1971. Washington, U.S. Govt. Print. Off., 1971. 670 p.

"This document is an update, since 1966, of the series of studies designed to identify Soviet space goals and purposes, organizations, resources, facilities and hardware; past and on-going programs of flights; research and applications; and projections of expected future plans: together with the international political and legal implications of these policies."

U.S. Congress. Senate. Committee on Aeronautical and Space Sciences. *Soviet Space Programs, 1971: A Supplement to the Corresponding Report Covering the Period 1966–1970.* Staff report by the Science Policy Research Division, Congressional Research Service, April 1972. 92d Cong., 2d sess. Washington, U.S. Govt. Print. Off., 1972. 74 p. (Committee print.)

The study supplements the previous study *Soviet Space Programs, 1966–1970*, adding new data on Soviet space programs. It also includes some refined interpretations of earlier events and some more direct comparisons with the United States effort in space.

U.S. Congress. Senate. Committee on Aeronautical and Space Sciences. *Space Agreements with the Soviet Union.* Hearings, 92d Cong., 2d sess June 23, 1972. Washington, U.S. Govt. Print. Off., 1972. 97 p.

The hearing deals with the space agreements signed between the United States and the Soviet Union, May 24, 1972. The purpose is to give some perspective to the hearings with respect to both policies for U.S. international cooperative programs in space and general relationships with the Soviet Union. Testimony was taken from officials of the Department of State and NASA. Background information on the agreements is included.

U.S. Congress. Senate. Committee on Aeronautical and Space Sciences. *Space Cooperation Between the United States and the Soviet Union.* Hearings, 92 Cong., 1st. sess., March 1971. Washington, U.S. Govt. Print. Off., 1971. [illegible]0 p.

Hearings, with testimony from officials of the Department of State and the National Aeronautics and Space Administration to update the Congress on discussions held between the United States and the Soviet Union on potential cooperation in space.

U.S. Congress. Senate. Committee on Aeronautical and Space Sciences. *Statements by Presidents of the United States on International Cooperation in Space: A Chronology: October 1957–August 1971.* 92d Cong. 1st sess. Senate Document No. 92–40. Washington, U.S. Govt. Print. Off., 1971. 126 p.

"This is a compilation of statements of four 'space age' Presidents of the United States, since October 1957—the beginning of the era of space exploration. It offers documentation on more than a decade of a consistent national policy for international cooperation which has been a part of the American

space program. It submits that the idea of cooperation among Nations on planet Earth was not only a natural technological consequence of space-oriented science and technology, as it evolved, but also was to be one of the purposeful reasons for the investment made by the American people in this new venture in the history of mankind."

U.S. Congress. Senate. Committee on Aeronuatical and Space Sciences. *United States International Space Programs: Texts of Executive Agreements, Memoranda of Understanding, and Other International Arrangements, 1959–1965.* Staff report. 89th Cong. 1st sess. Sen. Doc. No. 44. July 30, 1965. Washington, U.S. Govt. Print. Off., 1965. 575 p.

Includes the texts of executive agreements, memoranda of understanding and other international arrangements dealing with space made between 1959 and June 1965.

U.S. Congress. Senate. Committee on Foreign Relations. *Convention on International Liability for Damage Caused by Space Objects.* 92d Cong., 2d sess. Sen. Ex. Rept. No. 92–38, Oct. 4, 1972. Washington, U.S. Govt. Print. Off., 1972. 14 p.

Report recommending ratification of the Convention on International Liability for Damage Caused by Space Objects, signed on March 29, 1972.

U.S. National Aeronautics and Space Administration. Office of International Affairs. *International Programs.* January 1973. Washington, U.S. Govt. Print. Off., 1973. 70 p.

This short pamphlet gives a summary of major documents and statistics to describe NASA international activities. Items deal with authority and policy; data on cooperative projects, including: satellite and probe projects, foreign experiments on NASA satellites, mission definition and systems design studies, sounding rocket projects, earth resources survey, ground-based projects; reimbursable launchings; tracking and data acquisition cooperation, maps of station agreements, and data on personnel exchanges.

Valentine, Burl. "Obstacles to Space Cooperation: Europe and the Post-Apollo Experience. *Research Policy,* v. 1, Apr. 1972: 105–121.

Discusses the problems connected with foreign participation in the post-Apollo program and why the U.S. is interested in obtaining such participation.

Waldmann, Raymond J. "The Changing Outlook for U.S. Aerospace Abroad: a State Department Perspective." *Dept. of State Bulletin,* v. 70, May 27, 1974: 588–592.

An address by the Deputy Assistant Secretary for Transportation and Telecommunications.

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American Society of International Law. Panel on International Telecommunications Policy. *The International Telecommunication Union: Issues and New Steps: A Report*. New York, Carnegie Endowment for International Peace, 1971.

Codding, George A. Jr. *International Telecommunication Union: An Experiment in International Control*. International Propaganda and Communications Series, New York, Arno Press, 1972.

Freivalds, John "Bringing Space Down to Earth: Space Age Technology Transfer and the Developing Countries." *Journal of Developing Areas*, v. 8, Oct. 1973: 83–92.

Galloway, Eilene. "International Aspects of Earth Resources Satellites." Aug. 2, 1974. 18 p. Appears in U.S. Congress. Senate. Committee on Aeronautical and Space Sciences. *Earth Resources Satellites*. Hearings, 93d Cong., 2d sess. 1974. p. 264–281.

Galloway, Eilene. "Remote Sensing from Outer Space: Legal Implications of Worldwide Utilization and Dissemination of Data." Paper presented at a Symposium on the Legal Implications of Remote Sensing from Outer Space, October 16, 1975, Institute of Air and Space Law, McGill University, Montreal Canada. Typescript, 15 pp.

The paper addresses the current position regarding the use and dissemination of data, problems requiring attention, and likely national and international ways of approaching the future. The author deals specifically with the state of the art of the technology, the NASA agreement for ground stations, U.S. policy on an open discussion of data problems, and space treaties.

Kildow, Judith Tegger. *Intelsat: Policy-maker's Dilemma*. Lexington, Lexington Books, 1973. 118 p.

"Somewhat sketchy, but an informative review of the development of U.S. communications satellite policy during the 1960s which usefully highlights the policy issues involved in determining the character of our international participation."

Leive, David M. *International Telecommunications and International Law: the Regulation of the Radio Spectrum*. Dobbs Ferry, New York, Oceana Publications, Inc., 1970. 376 p.

Prepared under the auspices of the American Society of International Law.

Leive, David M. "The Future of the International Telecommunications Union." *Studies in Transnational Legal Policy*, no. 3, September 1972: 69 p. (Available from the American Society of International Law.)

A report under the auspices of the Society Panel on International Telecommunications Policy which evaluates the basic functions and structures of the ITU and recommends specific ways for improving the Union. Supported by NSF RANN award: GI–29927.

Levy, Steven A. "INTELSAT: Technology, Politics and the Transformation of a Regime." *International Organization*, vol. 29, no. 3, Summer 1975: 655–680.

"The question arises whether 'technological imperatives' or political considerations will guide the activity and determine the structure of regimes that support the use of technology on an international scale. In the case of communications satellites, the establishment of such a regime involves the search for structures that could satisfy technology and still remain responsive to political forces that desired to affect the decision-making process. The regime which has emerged resulted from the interplay of technology and politics. Initially it consisted of a single global agency, INTELSAT, but as the full potential of the technology became known, a single agency could not provide an adequate forum for the political interests that were associated with each new application that was discovered. Thus, the regime came to consist of a number of related organizations each dedicated to particular uses of the technology."

Misko, Carol. "Exploration in Intercultural Exchange by Satellite." Paper presented at the Annual meeting of the International Communications Assoc., New Orleans, April 1974. 5 p. Available from the State Dept. as FAR 20267–P.

Pelton, Joseph N. *Global Communications Satellite Policy: Intelsat, Politics, and Functionalism.* Mt. Airy, Md., Lomond Books, 1974. 193 p.

"An examination of the International Telecommunications Satellite Organization by a member of COMSAT, the Communications Satellite Corporation. The author tests and finds inadequate the functionalist theories of Ernst Haas and David Mitrany when applied to international communications satellite policy, but he sees value in INTELSAT as a prototype for international cooperation." (1)

Stanley Foundation. "International Cooperation in Outer Space: a Report of the 15th Strategy for Peace Conference." In Remarks of Frank E. Moss. *Congressional Record* [daily ed.] v. 121, Jan. 23, 1975: S810–S812.

Conference focused on the foreign policy and space policy role of U.S. toward communication, remote sensing, and other applications satellites and the role of international organizations in international cooperation in outer space.

Stull, Lee T. "United States Proposes Voluntary Principles on Direct Broadcasting by Satellite." *Dept. of State Bulletin*, v. 70, Apr. 22, 1974: 445–451.

U.S. State Dept. official's statement to the U.N. Outer Space Committee's Working Group on Direct Broadcast Satellites at Geneva on March 11–12.

United Nations. Dept. of Economic and Social Affairs. *The Application of Space Technology to Development.* New York, United Nations, 1973. 78 p. (United Nations. [Document] ST/ECA/161) "United Nations publication. Sales no. E.72.II.A.12"

The Advisory Committee suggested that developing countries should pay increased attention to the earth-oriented space technology applications, and consider carefully which of those applications could help solve their own priority problems and assist them in achieving a quantum jump in their development."

United Nations. General Assembly. Committee on the Peaceful Uses of Outer Space. *Report.* New York, United Nations, 1974. 39 p. (United Nations. [Document] A/9620)

Deals primarily with a report of the Scientific and Technical Subcommittee on the United Nations and Space Applications, including a treaty to register objects launched into space.

U.S. Congress. House. Committee on Foreign Affairs. Subcommittee on National Security Policy and Scientific Developments. *Foreign Policy Implications of Satellite Communications.* Hearings, 91st Cong., 2d sess. Washington, U.S. Govt. Print. Off., 1970. 212 p.

U.S. Congress. House. Committee on Science and Astronautics. *Report on the International Conference of States of the Distribution of Programme Carrying Signals Transmitted by Satellite.* Washington, U.S. Govt. Print. Off., 1974. 45 p. At head of title: Committee print. "Serial U"

THE SOVIET UNION AND EASTERN EUROPE: COOPERATION AND SCIENTIFIC AND TECHNOLOGICAL INFRASTRUCTURE

Ashbrook, John. "Soviet Military Might: Western Made." *New Guard,* v. 14, Jan.–Feb. 1974: 6–9.

Congressman Ashbrook writes that "perhaps as much as 90 to 95 percent of Soviet technology came directly or indirectly from the United States and its allies. Now this may sound incredible, but the facts substantiate this claim. Soviet aggression is dependent upon American-made and Western-made technology."

Branscomb, Lewis M. *Science, Technology and Detente.* (Washington). Program of Policy Studies in Science and Technology, George Washington University, March 1975. 35 p. (Program of Policy Studies in Science and Technology. Occasional Paper No. 17.)

A revised version of a paper presented to a January 1975 seminar sponsored by the Graduate Program in Science, Technology, and Public Policy of the George Washington University. The author examines the course of U.S.-Soviet scientific and technological relations and offers prescriptions for maximizing U.S. benefits in this relationship.

Butcher, William S. "U.S.-U.S.S.R.: Expertise Exchange," *Water Spectrum* v. 5. no. 1, 1973: 17–24.

"In the water resources field, U.S. and Soviet professionals will pool information, discuss each other's ideas and plan research, using experience developed in either country."

Campbell, Robert W. and Paul Marer. *East-West Trade and Technology Transfer: Proceedings of a Conference.* Bloomington, Indiana University, International Development Research Center, 1974. 85 p. (Studies in East European and Soviet planning, development, and trade no. 20)

"This report is a summary of the ideas and proposals for research generated at a conference on East-West Trade and Technology Transfer sponsored by the International Development Research Center at Indiana University. The goals of the conference were (1) to arrive at some sort of expert consensus regarding the state of knowledge and the issues in which more research needs to be done as a basis for decisions regarding the increases in trade and economic contracts with the Soviet Union, East Europe, and China expected in the coming decade; and (2) to suggest approaches and priorities for such research."

Callen, Earl and Edward A. Stern, "Abuses of Scientific Exchanges." *Bulletin of the Atomic Scientists.* v. 31, Feb. 1975: 32–35.

Argues that exchanges should be conditioned on the right of Soviet scientists to travel freely and be allowed to pursue their scientific work unmolested.

Casey, William J. "Technological Exchange and Detente." *Dept. of State Bulletin,* v. 70, Mar. 25, 1974: 308–311.

Address by the Under Secretary for Economic Affairs on Feb. 28 before a seminar on technology exchange with the U.S.S.R. held jointly by the representatives of 87 U.S. firms (press release 74).

Casey, William J., and others. "Technology Exchange With the U.S.S.R." *Research Management,* v. 17, July 1974: 7–17.

A series of four "articles by Federal Government leaders, review our experience to date, explain National policies related to technology transfer, and offer guidelines and suggestions on how to proceed in negotiating with the Russians."

Conference on Soviet Resource Management and the Environment. Held at the University of Washington, Seattle, June 1974.

Various papers dealing with water pollution, manpower, raw materials, the environment, air pollution, non-fossil energy resources, agriculture, and urban growth available from the Office of External Research, U.S. Department of State.

DeHaven, James C. *Technology Exchange: Import Possibilities From the U.S.S.R.* Santa Monica, Calif., Rand, 1974. 37 p. (Rand Corporation. [Report] R-1414-ARPA.)

Report "discusses what forms of technological information from the Soviet Union may be useful to the United States for saving our own resources, paying in kind for U.S. technology, or negotiating for transfer of our technology to the Soviet Union."

Dockum, Maj. Robert R. "United States Trade with the Soviet Union: Effects on United States National Security Policy." Report no. 0790, Air Command and Staff College, Air University, May 1974. 58 p. Available from the State Department as FAR 21801-G.

"East-West Think Tank Born." *Science*. October 13, 1972: 143.

Describe the origins of the International Institute for Applied Systems Analysis and the role of the National Academy of Sciences in establishing the research center.

Elliot, Iain F. *The Soviet Energy Balance: Natural Gas, Other Fossil Fuels, and Alternative Power Sources*. New York. Praeger, 1974. 277 p.

"An admirable exposition of the Soviet Union's situation and prospects in energy, bringing together a wealth of statistical information from scattered Soviet sources. One of the main conclusions is that increasing domestic consumption will intensify the problem of keeping up exports of oil and gas to Eastern and Western Europe." (1)

Fedoseev, P. N. "The Social Significance of the Scientific and Technological Revolution." *International Social Science Journal*, v. 27, 1975: 151-162.

A Marxist point of view by the Vice President of the Soviet Academy of Sciences. Science and social problems/Technology and social problems.

Ginsburgs, George. "The Soviet Union and the Biosphere." *International Journal*, v. 28, winter 1972-73: 50-68.

Concludes that the U.S.S.R. is on a par with the "capitalist" countries in the quality of its environmental policies.

Graham, Loren R. "Aspects in Sharing Science and Technology." In *U.S.A.-U.S.S.R.: Agenda for Communication*. Philadelphia, American Academy of Political and Social Science, 1974. *Annals*, v. 414, July 1974) p. 84-95.

Discusses the problems of Soviet-American scientific exchange in light of the human-rights issues of Soviet scientists.

Graham, Loren. R. "The Formation of Soviet Research Institutes: a Combination of Revolutionary Innovation and International Borrowing." Paper at the annual meeting of the International Slavic Conference, Banff, Canada, September 1974. 25 p. Available from the State Dept. as FAR 20020-P.

Gromyko, Anat. "Washington's New Technological Policy." *International Affairs* (Moscow), no. 2, Feb. 1972: 42-69.

Discusses the concept of a "broad technological exchange" in the international arena as a new mode of U.S. foreign policy.

Hanson, Philip. "The Russian Connection." *New Scientist*, v. 65, Jan. 23, 1975: 195-197.

"Despite its repudiation last week of certain terms of its trade agreement with the U.S., the Soviet Union maintains a keen appetite for western technology. Though it should have much to gain from such trade, the U.S.S.R. is still extraordinarily self-sufficient in machinery and plant."

Harvey, Mose L., Leon Goure, and Vladimir Prokofieff. *Science and Technology as an Instrument of Soviet Policy*. (Miami) Center for Advanced International Studies, University of Miami, 1972. 219 p. (Monographs in International Affairs)

"The purpose of this book is to give a documentary account of the Soviet leaders' views of scientific technological progress and the present and future role they expect it to play, especially in the sphere of East-West competition."

Holden, Constance. "Soviet-U.S. Summit: Science Accords Open the Way to Joint Projects." *Science*, v. 176, June 9, 1972: 1106-1108.

"The strategic arms limitation agreement was the crowning public achievement of the Russian-American summit meeting, but several other accords, for which quiet preparations had been months in the making, promise to to supply a coherent framework for cooperation in the areas of health, space, the environment, and science and technology."

Horelick, Arnold L. "The Soviet Union, the Middle East, and the Evolving World Energy Situation." *Policy Sciences*, v. 6, Mar. 1975: 41-48

An assessment of Soviet energy policy in the next ten years as reflected in international political terms.

Irwin, Theodore. "Washington-Moscow Medical Hot Line." *Parade [Washington Post]* Mar. 31, 1974: 14, 16–17.

A medical and scientific information exchange system between Moscow and Rockvile, Md., was opened in the fall of 1973.

"Is U.S. Giving Away Too Much to Russia?" *U.S. News & World Report*, v. 77, Sept. 23, 1974: 68–74.

"For the Soviet Union: a huge truck plant . . . a fertilizer complex . . . oil and gas development . . . all made possible by U.S. know-how. What next? Advanced computers? Aircraft factories? Critics ask what U.S. gets in return? Includes an interview with Robert C. Seamans, Jr., president of the National Academy of Engineering and a top Pentagon and NASA official."

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